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Telephony.

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By the Way—

Don't forget the Independent telephone convention in Chicago June 24, 25 and 26.

Uncle Sam is about to send the telephone properties back home after hiring their services during war time.

Before releasing them, he should see that they are able to resume business at the old stand as fit as they were when he requisitioned their services.

Our national relative has a habit of giving only what he is asked for, and it, therefore, behooves telephone owners to define their demands clearly and press them vigorously.

Telephone Legislation.

The eyes of the telephone world are turned toward Washington these days, straining to see what Congress will do to help the industry before releasing the properties from government control. That the wire plants are to be returned to private operation is considered certain, but just when and under what conditions remains to be determined. The latter question is the more important.

What legislative relief will Congress furnish that will enable telephone owners to take back their properties and resume service in safety?

Rates must be guaranteed the companies that will permit them to operate efficiently and "carry on" under the new conditions that have developed since government control began last August. Federal authorities concede this, and recognize the necessity of action that will insure adequate compensation in the future. The recommendations of the Wire Control Board, sent to Congress by Postmaster General Burleson, will be found on another page of this issue, and should be given careful consideration by all telephone men.

Several important points are emphasized in this report. One is that in the "co-ordination" plan, single ownership is not advocated, but is, in fact, specifically disclaimed. A telephone monopoly is not desired today any more than it has been in the past.

It is also recommended that the Interstate Commerce Commission be the body to have control of wages of competing telephone plants, under conditions *"which will protect the interests of the public and of nearby companies."* We all know that the public favors one operating company to a community, and if a consolidation preserves the connections and rights of adjacent companies, the plan seems to be in line with the policy of the United States Independent Telephone Association.

Another essential point is that providing for centralized regulation. This does not tend to government ownership, and, in fact, will lead directly away from it, by providing adequate rates that will enable the companies to render good service, and maintain themselves in an independent, businesslike fashion.

The suggestion is made that the Interstate Commerce Commission regulate all telephone rates, but it is understood that this will be optional with the companies. That is to say, a company desiring to avail itself of this centralized regulation may do so by taking out a federal charter, or making certain filings. Any company which does not so desire can remain under state commission control as at present.

The plan to have wage scales and other expenses controlled by a board that would be in duty bound to grant the rates necessary to meet such expenses, is, of course, most praiseworthy. It stands to reason that the regulatory body that raises wages should raise rates to meet that increased expense.

Another important suggestion is that if a centralized regulation is put into effect, all small companies would be able to get long distance connections under uniform rules and practices, which would undoubtedly benefit them and encourage their development.

Independent telephone leaders are in Washington this week in conference on the legislation program, and hope to secure action that will safeguard the industry. There may be a difference of opinion as to what machinery should be devised, but all are agreed that before the companies are turned back, they must be guaranteed rates that will enable them to cope with new conditions.

A natural anxiety is felt that there is danger in having telephone rates under the sole regulation of state commissioners, on the ground that the commissions are still smarting under federal invasion

of their rights, and that they may not accord the companies the prompt relief they need. The plan of having the Interstate Commerce Commission regulate telephone rates appeals favorably to many of the leading operators, for the very good reason that the federal government has shown a ready disposition to raise rates which is frequently lacking on the part of the state boards.

The United States Independent Telephone Association holds its national convention in Chicago in three weeks, and, unless the question is settled before then, the telephone men who attend that meeting should come prepared to take action and let Congress know what they desire done. They possess a political influence which, if properly exerted, will prove sufficient to insure the telephone industry a square deal.

Some of his critics intimate that the Postmaster General retains some shreds of his dreams of government domination of all the wires as one system, as he speaks of a co-ordination of the various systems, as a means to avoid "wasteful competition," "economic loss occasioned by duplications of plants," and the like. It is significant, however, that he expressly states that *"Co-ordinated operation does not require monoply of ownership."* At a time when this country and the whole world are eager to escape from the idea of a machine-run universe, this remark is not surprising.

No one desires to defend "wasteful duplication" in the telephone industry or in any other line. The trend of today is away from that condition. Both Independents and Bell recognize that fact. Recent issues of TELEPHONY have contained specific examples of the practical demonstration of the theory. The absorption by the Independent companies at Jamestown, N. Y., and Athens, Ohio, of their competitors are cases referred to.

Any so-called "co-ordinated operation" of the telephone systems, must provide that the companies are assured adequate rates and equitable practice, under the higher cost of doing business of the present day. The government agreed to turn back the properties in as good shape as they were when they were commandeered August 1, 1918.

Wages and materials have advanced and rates have not kept pace. There must be an adjustment before the properties are turned back. The railroad administration is asking an appropriation of $1,200,000,000 prior to turning the railways back to private hands. Mr. Burleson would like several hundred millions to balance up the wire deficit, but he has little chance of getting it. Common fairness and ordinary caution in fostering a national industry, however, demand that the wires be given protection in the way of adequate rates in the future.

Properly administered, a vast amount of good can come out of the recommendations of the Wire Control Board. Rate regulation by a fair-minded body which will see to it that the companies have an income commensurate with advanced expenses is of prime importance.

Control of mergers so that the public interest and the rights of nearby companies are maintained is essential. It should be borne in mind, however, that there should be diversity of ownership. The United States does not want a telephone monopoly in any one's hands. Furthermore, the people do not want government ownership of telephones. For that very reason, centralized regulation of rates appears a step in the right direction.

A strong argument for centralized regulation is that it will enable telephone companies to meet present conditions with good service, to furnish which they must have adequate rates. If the legislation is obtained to enable the companies to supply that service and maintain a well-trained, well-paid, force of employes, there will be no further talk of government ownership. Failure to deliver efficient service, however, will lead to a revival of the government ownership agitation.

It is expected that the state commissions will be given a place in the scheme of co-ordinated regulation, as their usefulness is recognized and it is desired that they continue to function. As stated before, some local companies may prefer to remain under state jurisdiction alone.

It is the desire and intention of the leaders to formulate a plan that will protect all interests in the industry. If the properties are finally released from government control under a scheme which will establish the private owners on a sure and sufficient basis of doing business in the future, the federal experiment will not have been a total failure after all.

Wire Legislation Before Congress

Committee Hearings on Proposed Legislation Relative to Return of Wire Properties to Private Operation Now Under Way — Postmaster General Presents His Views as to Legislation Which Should be Enacted

Congress is losing no time in taking up the question of the return to private control and operation of the wire properties of the country.

This week Independent telephone men were in Washington to present to the committees to which the various bills relating to the telephone companies have been referred, their views on the kind of legislation that should be adopted before the properties are turned back.

Last week at the meeting of the board of directors held in Washington, routine matters occupied most of the time, 76 companies being received into membership. Legislative matters were considered and the action of the executive committee in appointing a legislative committee was approved.

This committee is now active in seeing that the members of Congress are properly informed regarding the telephone industry.

Quick Senate Action Expected.

Quick action in the Senate is expected by Republican leaders toward returning the telephone and telegraph systems to private control. The President's reference to that subject in his message had been anticipated by Republican and Democratic senators, who, irrespective of executive initiative, had measures bearing on the matter ready to offer. Similar measures looking to the return of the railroads to private control are to be offered later.

Senator Kellogg of Minnesota offered a resolution on May 20 to repeal the existing law under which the wire systems were taken over by the government and to return the systems at once to their private owners. Another resolution to repeal the present law affecting the wire systems was offered by Senator Gore of Oklahoma.

Senator Kellogg's resolution will be backed by the Republican majority. It

was drawn after a conference with Senator Cummins, who is chairman of the Interstate Commerce Committee, and who is to offer the bill for restoring the railroads to private control.

Under Senator Kellogg's measure the President is required to "cause to be made a detailed and itemized account and report of all his acts and proceedings in connection with the supervision, possession, control, and operation" of the wire systems.

The Senate majority wants the wire systems restored to private control at once, and every effort is to be made to push the Kellogg resolution to an early vote.

Burleson Gives Recommendations.

In a letter to Judge Moon of Tennessee, the retiring Democrat chairman of House Committee on Post Offices and Post Roads, and now the ranking Democrat member of that committee, Postmaster Burleson has transmitted recommendations of the Wire Control Board for legislation returning the telephone and telegraph systems of the country back to private ownership. These recommendations are:

1.—That the various wire systems be co-ordinated as to operation, and that subject to the approval of the Interstate Commerce Commission, any wire company may purchase or merge with another wire company.

2.—That the Interstate Commerce Commission be empowered to fix interstate rates.

3.—That the rates be so fixed that they shall yield a reasonable return on the value of the property.

4.—That a tribunal on which the public, employes, managerial force, and capital shall be fairly represented, shall be created in order to hear grievances affecting working conditions and wage changes.

5.—That no alteration of wage schedules shall be made until approved by the Interstate Commerce Commission, which will then decrease or increase the rates proportionately.

The Postmaster General's letter to Judge Moon reads:

"I have before me the House resolution No. 2, introduced by the Chairman of the Committee on Post Offices and Post Roads, proposing the termination of government supervision, control, and operation of the telegraph and telephone systems.

Interests Should Be Safeguarded.

"In my opinion the enactment of this resolution without legislation to properly safeguard the various interests involved would be very unwise. The vexatious problems confronting the wire companies will not be satisfactorily solved by a mere return of these properties to their owners.

The extraordinary increased cost of the operation and maintenance which has been fastened on them as a result of the war will continue for some time after control passes from the government. These increased costs of operation and other difficulties confronting these companies are not the result of government control, but had been imposed on these companies as result of the war.

That this is true is conclusively shown by an examination of the conditions of the street railway systems of the country or of any other public utility.

These wire properties cannot in fairness to the owners or the general public, be returned under the burden of these increased costs of operation without assurance of revenue sufficient to meet such increased cost, for otherwise deterioration of the properties and the service will inevitably result, and the public as well as the owners and investors in the securities of these companies will be disastrously affected.

Manifestly the former rates are inadequate to produce the necessary revenue to meet existing requirements to maintain and operate these properties. New materials must be purchased at market prices and skilled labor employed at previaling wages.

Because of these extraordinary changes in the operating conditions of these properties a serious responsibility rests on the government to adopt every means possible, consistent with sound policy, to protect the public and enable the owners to operate their properties free from dangers of receivership or the serious impairment of their values or the deterioration of this important service. In my opinion some legislation to meet this situation is imperative.

In response to your verbal request I will give you the views of the Wire Control Board on the legislation which it is believed should be enacted before these properties pass from the control of the government.

Would Permit Combinations.

"The members of the board are unanimously of the opinion that in order to provide the most efficient wire service, the various systems should be co-ordinated as to operation. This does not require monopoly of ownership but is necessary so that there can be a consistent and harmonious regulatory policy. Through this means only can the attempts at wasteful competition and the economic loss occasioned by duplication of plant and force be avoided.

It is believed that this desirable end can be reached by amending the law so as to provide that, subject to the approval of the Interstate Commerce Commission, any telegraph or telephone company doing an interstate business may purchase the property of any telegraph or telephone company, or any part thereof, or consolidate with any other telegraph or telephone company, or pool its traffic and facilities with any other telegraph or telephone company, under provisions which will protect the interests of the public and of nearby companies.

The Wire Control Board is also convinced that it is impossible to secure any uniformity of rates, or to maintain adequate revenue for the service, where a multiplicity of unassociated, independent authorities or commissions with full authority to act, are attempting to function. Whereas it is recognized that the state has control over traffic purely intrastate, yet it is believed that it is no longer open to the question that this power cannot be exercised so as to interfere with interstate traffic.

Intrastate and Interstate Relations.

"In the matter of electrical communications, the intrastate and interstate activities are so interdependent that what affects one affects the other, and the character of this traffic has so changed through development that the interstate features have become the dominant and controlling factors.

Hence it is believed that the law should be so amended as to empower the Interstate Commerce Commission to fix rates for telegraph and telephone companies subject to the provisions of the act, and that any telegraph or telephone company whose lines are located entirely within a state, but which transacts direct interstate business through switching or other arrangements with other lines should be made subject to the act.

The public interests demand the most efficient wire service possible. In order that this end may be attained adequate revenue must be provided. The plant and equipment must be of the best constructed and of the very latest development of the art and must be properly maintained, and depreciation and obsolescence, with reasonable reserves for surplus and contingencies, must be provided, and also a reasonable return on the value of the property used to furnish the service.

In order to make certain the maintenance of these conditions, the rates of the telegraph and telephone companies falling under its jurisdiction should be fixed by the Interstate Commerce Commission so that they shall produce revenues sufficient to yield a reasonable return on the value of the property used in rendering service, after paying operating and maintenance of such adjuncts as may be necessary for the development of the art and preservation out of income for surplus and contingencies.

Provision for Employes.

"The board is also convinced that in order to provide satisfactory wire service, the most efficient personnel must be secured. In order to secure and retain the service of such employes, there

must be assured proper working conditions, advancement of wages on the basis of demonstrated efficiency or capability, and these conditions can only be brought about by the adoption of a sound policy in the treatment of such employes.

In order to assure this, a tribunal should be provided upon which the public, the employe, the managerial force, and capital shall be fairly represented, and before which all parties may be heard, so that prompt redress may be had for just grievances.

The Wire Control Board also suggests that it be provided by legislation that hereafter when any change of wage schedules for employes is contemplated, the same shall not become effective until submitted to and approved by the Interstate Commerce Commission. The commission shall contemporaneously order such modification of rates as will meet the proposed changes in the wage schedule.

I feel constrained by sense of duty to urge upon the committee dealing with this important matter that before action is taken a serious and unbiased consideration be given to the necessity of some such legislation before these properties are returned to their owners."

Discussion of Burleson's Suggestions.

The letter which Postmaster General Burleson sent to Judge Moon of the House committee on Post Offices and Post Roads does not advocate a single ownership of the telephone properties—in fact, it is specifically disclaimed. The intent is not to urge mergers but simply to provide a means whereby they may be permitted when it is in the public interest.

It is generally recognized that there is a public demand for the elimination of competing exchanges and abolition of duplicate telephone service has been going on for some time in haphazard fashion. After approvals of merger by municipal authorities and state regulating bodies, the Department of Justice acts in a manner that is unusual when compared with its procedure in other cases, for the Department of Justice is necesarily compelled to recognize public demand and insert the rule of reason in the Sherman act.

Mr. Burleson's letter suggests that the Interstate Commerce Commission is an appropriate body to have control over mergers and to have authority to permit them under conditions which "will protect the interests of the public and of nearby companies." This for years has been the attitude of the national Independent telephone association. There has been no serious objection to consolidations provided connections were maintained.

The nearest the Postmaster General comes to a single control is to suggest "a consistent and harmonious regulating policy." In his opinion the Interstate Commerce Commission should be authorized to fix rates for telephone and telegraph companies and any company which connects for interstate business should be under its control. This last idea is in harmony with the unanimous thought of the directors of the United States Independent Telephone Association except that their idea favors a specially appointed regulatory board which will be able to act more speedily than the Interstate Commerce Commission.

There may be some difference of opinion as to the machinery through which a board in the interests of capital, management, employes and the public would operate in order to see that wages are not raised without the necessary increases in rates. The association directors are unanimous in the idea that if they could get a federal regulatory board that would act directly as an administrative body usually acts and which had coupled with its power over rates, service, and practices, the burden of keeping rates in synchronism with wages and expenses, the best results would be obtained.

It is pointed out that no one in the wire industry advocates a monopoly of ownership and that all interests—big and little—concede that diversity of ownership is beneficial. While the industry is united in favor of centralized regulation, it is not in favor of any plan that tends to government ownership.

One reason as to the favoring of centralized control is the necessity for meeting modern conditions with proper and efficient service. In order to do this the companies must secure adequate rates and proper regulation, which is not possible now.

If legislation is secured that will allow the industry to maintain efficient service and a well-trained and well-paid force of employes, there will be no necessity for government ownership. On the contrary, if a proper system of regulation is not obtained, deterioration of service will bring about a demand for, and the ultimate accomplishment of, government ownership.

These are the things in the minds of the telephone men who are presenting their views to the committees of Congress to which proposed legislation has been referred.

Elective Railroad Commission Proposed in Wisconsin.

Arguments for an elective railroad and tax commission were advanced before the Wisconsin senate corporations committee May 13. Senators H. E. Roethe, Fennimore and H. J. Severson argued in favor of the measure, claiming that an elective commission would restore public confidence in the commission. They were supported by A. R. McDonald, representing the railroad trainmen, and J. W. Long, of the American Society of Equity.

W. L. Smith, of Neillsville, representing the Wisconsin State Telephone Association; P. J. Weirich, general manager of the United Telephone Co., Monroe; W. A. Jackson, Milwaukee, representing the Milwaukee Electric Railway & Light Co.; J. A. McCormick, representing the Milwaukee Association of Commerce, and A. L. Osborne, Oshkosh, representing the Northern Hemlock Association, opposed the elective plans for a railroad and tax commission.

"The present railroad commission would have been just as unpopular whether it was elective or appointive, because they had to make decisions at a time when prices were raising and not lowering," said Mr. Smith. "When the railroad commission law was enacted the so-called progressives were for an appointive plan and denounced all others who opposed them and favored an elective commission as conservatives. Now the question has turned around. It all depends on who is governor. I think the commission has done good work and that we should make no change now that the policy of the state has been settled in favor of an appointive plan."

Mr. Weirich spoke briefly and said that he believed from the tenor of the law that an appointive official would be better on the commission than an elective man.

"I have had experience with but one elective commission," said Mr. Jackson. "That was out in the state of Oregon, and they put a new commissioner on every two years. The bad thing about this is that there is always a new man on the commission who has to be educated to his duties. Such changes are detrimental to the public sevice. I think by the appointive plan you will get a better, well-balanced commission."

Mr. Osborne said that he wanted to be on the record as opposing an elective tax commission and Mr. McCormick declared that he endorsed the arguments of those who opposed the bills.

Injunction Against Telephone Rates in Arkansas Denied.

Temporary injunctions were denied in both the cases of the Arkansas Corporation Commission and of the city of Little Rock against the Southwestern Bell Telephone Co. to prohibit it from continuing to put into effect its new rates by Judge Jacob Trieber in United States district court at Little Rock, Ark., May 13. Judge Trieber said it would be useless to give an opinion in these cases until similar cases now pending in United States Supreme Court are decided.

However, he said that he would issue an order requiring the telephone company to file a stipulation within three days in which it agrees to refund all money collected in the enforcement of the increased rates, should the case be finally decided against it.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties—Prepared Under the General Supervision of Stanley R. Edwards—This Section, "Part VII, Telephone Engineering Economics," Written by Chas. W. McKay

Quiz Questions on the Preceding Installment.

72. Discuss the guying when a change is made in the size of an aerial cable. Illustrate a method of dead-ending heavy cable leads. How is a cable lead guyed when the line is erected upon a hillside? Describe a method of abruptly terminating a heavy cable lead where it is impossible to place an end anchor or guy strand.

73. In preparing detailed construction plans, what is it most important that the plant engineer keep in mind? How may the plant engineer aid the construction foreman?

74. What should always be remembered in preparing detailed construction plans? When is it not considered good practice to adopt the open-wire method of distribution? Under what conditions is it considered good practice to place an aerial cable at the time of the original installation?

75. Give an illustration where the following of the rule relative to placing of aerial cable instead of open wire at the time of the original installation would have been a serious error.

76. Why is it well for the plant engineer to prepare sketches showing the exact locations of the cross arms on poles? Show the relation between tree trimming and the specifying by the plant engineer of the exact location of cross arms.

77. What is the question confronting the plant engineer after the preliminary steps in planning an open-wire distributing line have been taken? What kind of wire affords an excellent medium for exchange distribution and under what conditions?

78. State the very general rule for guidance in choice between the aerial methods of distribution.

79. How do some companies effect a compromise in regard to the rule just given?

CHAPTER III. Subdivisions of Telephone Engineering (C't'd).

80. *Objections to temporary distribution methods.*—Telephone engineering experts disagree as to the wisdom of this practice. It is thought, however, that the individual disposition of any specific case will be largely dependent upon the peculiar conditions existent in the district to be served. The writer has known of cases where this method of distribution—by No. 17 wire—has been carried to excess with very disastrous results.

In one case in particular, a plant located in central New York, where the winter climatic conditions are very severe, used a twisted-pair-in-ring distribution—frequently call the "Locke aerial," "Cameron" or "aerial-conduit" type of distribution—for an immediate development requiring as many as 10 or 15 circuits. In other words, a small suspension strand was placed, equipped with rings, and through these rings there was pulled a bundle of 10 or 15 No. 17 twisted-pair wires. The company even went to the extreme of forming the wire into a temporary table by use of a serving of marlin.

In the wintertime, moisture resulting from successive rain and snowstorms, would penetrate to the interior of this temporary cable; the insulation deteriorated and frequent line trouble resulted. It was often necessary to remove the wires from the rings, undo the marlin serving and spread the wires out to allow the insulation to dry.

Even in localities where the winter conditions are not prohibitive, the high cost of No. 17 copper-clad steel twisted-pair wire imposes a limiting factor, especially in view of the fact that such wire is usually replaced ultimately by lead-covered cable. It frequently happens that the No. 17 wire thus replaced has deteriorated to such an extent that its further use, as drop wire, is out of the question. Obviously, this results in a very expensive temporary mode of distribution especially as the scrap value of a copper-clad steel wire is negligible.

On the other hand, there may be cases where a temporary distribution system of the type just described may be well adapted to meet the peculiar requirements of a certain community.

In the writer's opinion, however, this so-called "'Locke aerial," or "aerial conduit" method of distribution should be generally avoided.

81. *Drop wire spans.*—In connection with the general discussion (section No. 63) of the subject of pole location, emphasis was placed upon the necessity of so locating terminal poles as to provide minimum drop wire lengths. This subject of drop wires is a most important one and should be given the utmost consideration by the plant engineer in laying out the field plans for actual construction work. Especially is this true in the northern climes where drop wires are likely to become heavily coated with ice in the wintertime, and the additional weight caused by the ice coating may result disastrously.

The span from the subscriber's premises to the nearest pole should be as short as possible. In cases where it is not feasible to provide short drop-wire spans, an effort should be made to provide intermediate support between the house and the nearest telephone pole by attaching to poles of foreign companies, buildings and, even in some cases, to trees.

82. *Drop-wire supports.*—If attachment is made to poles of foreign companies, care should be exercised to observe the joint-use specifications which have previously been outlined.

In making house attachments, it should be remembered that wires strung past the windows of a residence are likely to be the subject of unfavorable comment on the part of property owners, and may result in ill feeling towards the company, and a considerable expense in rerouting circuits.

Tree attachments are not desirable, except as a last resort. When necessary, however, every effort should be made to provide proper mechanical protection between the wire and the tree. The reason for this is two-fold: In the first place, wires that are allowed to play freely over the limbs or trunks of trees, are very susceptible to "trouble." The constant friction of the wires destroys the insulation and causes either a short circuit, ground, or an open.

The second reason for the exercise of care in making tree attachments is that the constant friction between improperly protected telephone wires and tree limbs or trunks, is apt to damage the trees. Such damage frequently results in dispute with property owners and municipal, or park, authorities.

It may seem to the reader that many comparatively unimportant points have been discussed in the consideration of the subject of aerial wire distribution. It should be remembered, however, that operating expenses are materially affected by "trouble." The writer's own experience, some years ago, as a "trouble-shooter" has proven conclusively to him that at least 80 per cent of aerial line trouble can be prevented by a little thought and care in original installation methods. The

fact that many of the larger companies recognize this point, is evidenced by the elaborate instructions, where they exist, supplemented by illustrations and diagrams, for the proper installation of the aerial line and drop wires.

83. *The aerial cable plant.*—In planning an aerial cable plant, the plant engineer should bear in mind the immediate requirements and the ultimate requirements as shown by the fundamental plan or development study. The size of distribution cables must, of a necessity, be largely dependent upon the ultimate requirements of the immediate district to be served.

First, it is necessary to determine the "units" which will be ultimately required to serve a specific area. Such units may be city blocks, or, in some cases, groups of city blocks.

84. *Distribution cables.*—It is always preferable to install feeder or distribution cables in alleys, when such a course is possible. Most cities are so laid out as to provide a system of alleys in between the various residential streets. In such cases feeder or distribution cables should always be placed in the alleys. Where this is not possible, due to the fact that alleys are non-existent, distribution cables should be placed upon alternate streets. The size of such distribution cables is largely dependent upon the immediate requirements of the territory under consideration.

The plant engineer must first determine the "units" that will be ultimately cared for by a given aerial cable. Such units, as previously suggested, may be blocks or groups of blocks. In Fig. 23, a tentative cable layout is illustrated.

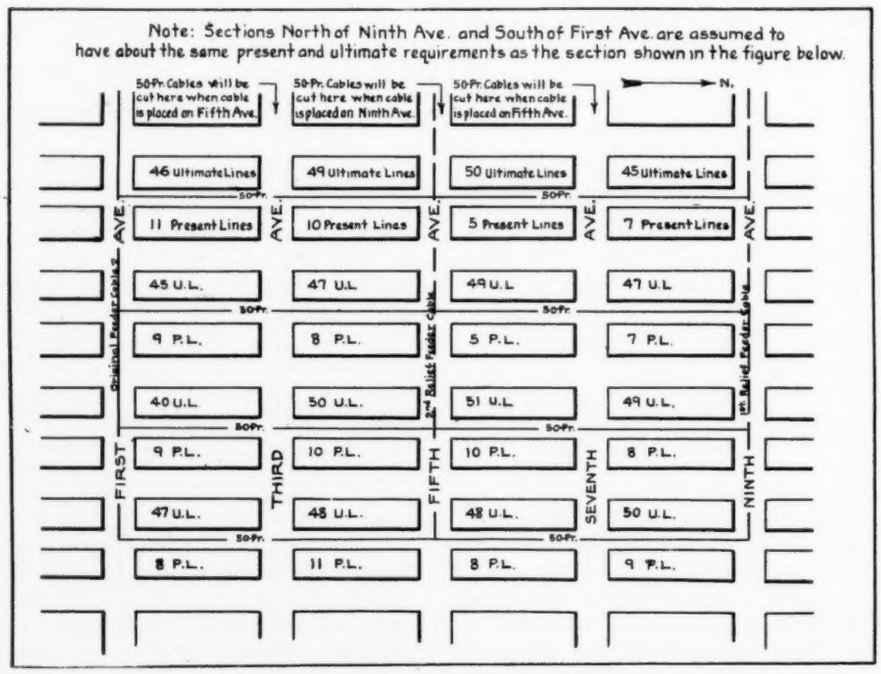

Fig. 23. Tentative Cable Layout.

In this case it has been assumed that the alley method of distribution is possible, and it will be noted that cables are provided upon alternate alleys. The units of distribution have been assumed to be 50-pair cables. In small towns, however, occasions may arise where it is advisable to place 25 instead of 50-pair cables. Obviously, these distribution cables must be utilized to their ultimate capacity for some time to come. Eventually they will be cut and each 50-pair unit shall be utilized to serve a certain small and constricted area.

85. *Method of temporary cable distribution.*—The method of temporary distribution is illustrated in Fig. 24. It will be noted that the cable-pair assignments are so arranged that no two blocks, or groups of blocks, have the same assignment of pairs. For instance, if a 50-pair cable is run for four blocks, the cable pairs are so terminated that no two corresponding terminals have the same assignment of cable pairs.

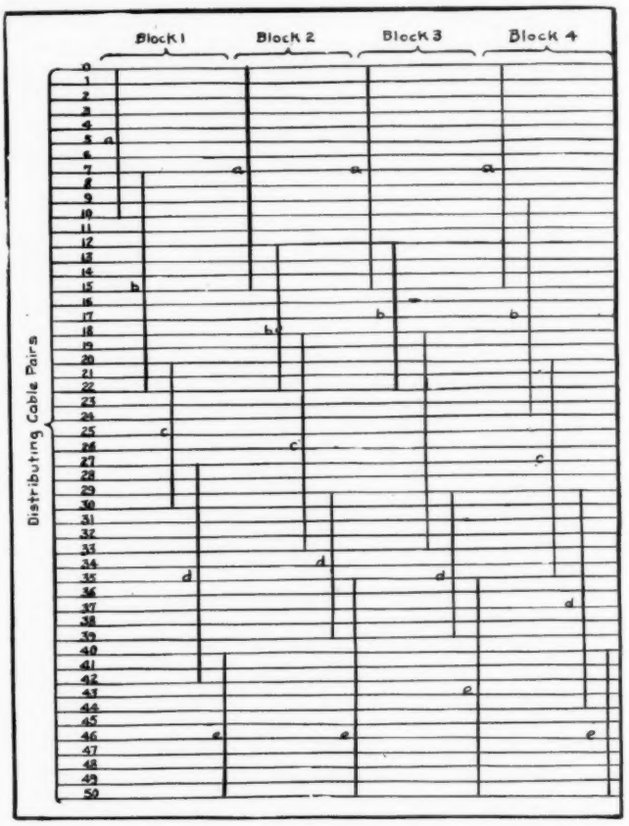

Fig. 24. Method of Temporary Distribution of Cables.

Referring to Fig. 24, in block No. 1, terminal *A* has an assignment of pairs 1 to 10. Terminal *A* in block No. 2 has an assignment of pairs 1 to 15; terminal *B* in block No. 1, an assignment of pairs 8 to 22; and terminal *B* in block No. 2, an assignment of pairs 13 to 22.

By using such a method of cable-pair distribution, a temporary arrangement of cable assignments may be utilized for a long period without confliction.

It will be observed, however, that 50 pairs are terminated in every set of blocks. Therefore, when the ultimate cable disposition is arranged for—by the installation of additional feeder cables—the cables may be cut and each block, or set of blocks, will have the full cable capacity distributed over its area. In the case under consideration, a 50-pair cable has been distributed over four blocks. When the ultimate arrangement of cable-pair assignment has been provided for, each pair of blocks will have a component of 50-pairs. It is thought the reader will grasp the significance of this arrangement.

(To be continued.)

Talk by Telephone from Train.

The train telephone, working with wires and railroad tracks, was used successfully on the Philadelphia & Reading last week. Conversation was carried on between a moving train in Jenkintown, Pa., and the offices at the Reading terminal. Only one section of track had been wired, but officials said that the experiment assures that virtually every train on the division soon will be equipped.

Operation of Thermionic Amplifier

Theory of Operation of Three-Electrode Thermionic Vacuum Tube Based on Fundamental Equation of Family of Characteristic Curves for Various Plate and Grid Voltages—Reprinted by Permission of Institute of Radio Engineers

By H. J. van der Bijl, M A., Ph D.

VII. Amplification Equations of the Thermionic Amplifier.

On the strength of the two assumptions discussed in the previous paragraphs, namely, that the amplification is independent of the input and the frequency, it is possible to derive the equations of amplification in a very simple way. Referring to Fig. 4, let the current in the external resistance R be varied by variations produced in the grid potential, E_c. Then, as was shown in a preceding paragraph, E_B is also a variable depending on the current I, as shown by

$$E_B = E - RI, \qquad (22)$$

where E is the constant voltage of the battery in the output circuit $FPER$. Hence

$$I = \Phi\ (E_B, E_c),$$

from which

$$\frac{dI}{dE_c} = \frac{\partial I}{\partial E_B} \cdot \frac{dE_B}{dE_c} + \frac{\partial I}{\partial E_c}$$

This gives the variation of current in R as a function of the variation in the grid voltage.

Substituting from (9) and (10),

$$\frac{dI}{dE_c} = 2\alpha\,(\gamma E_B + E_c + \epsilon)\left(\gamma\frac{d(E-RI)}{dE_c} + 1\right)$$

that is,

$$\frac{dI}{dE_c} = \frac{2\alpha\,(\gamma E_B + E_c + \epsilon)}{1 + 2\alpha\gamma R\,(\gamma E + E_c + \epsilon)}$$

Multiplying throughout by R, and putting $\gamma = \frac{1}{\mu_o}$ we obtain by a simple transformation

$$R\frac{dI}{dE_c} = \frac{\mu_o R}{R + \dfrac{E_B + \mu_o\,(E_c + \epsilon)}{2I}} \qquad (27)$$

Now, $R \cdot dI$ is the voltage change set up in the resistance R, and dE_c is the change in the input voltage. Hence equation (27) gives the voltage amplification produced by the device, which we shall call μ. Furthermore, it follows from section IV that the output impedance of the amplifier is given by

$$R_o = \frac{E_B + \mu_o\,(E_c + \epsilon)}{2I} \qquad (13)$$

Hence the voltage amplification μ is given by

$$\mu = \frac{\mu_o R}{R + R_o}. \qquad (28)$$

From this equation it is seen that the voltage amplification asymptotically approaches a finite value μ_o, which is attained when the external resistance R becomes infinitely large compared with the output impedance of the amplifier.

In order to find the power amplification it is necessary to know the input impedance of the amplifier; that is, the impedance of the circuit $F\ G\ E_c$ (Fig. 4). Now, the amplifier is operated, as was stated above, under such conditions that no current is established in the circuit $F\ G\ E_c$. The impedance of this circuit is, therefore, infinite, and the power developed in it is indeterminate.

In order to give the input circuit a definite constant resistance, Mr. Arnold suggested shunting the filament and grid with a high resistance. This can be considered as the input resistance R_i, of the amplifier. The input voltage is that developed between the ends of this shunt resistance.

If, now, e *and* e_i represent the voltages established between the ends of the output and input resistances R and R_i respectively, the power developed in R and R_i is e^2/R and e_i^2/R_i. Hence the power amplification is

$$\eta = \frac{e^2 R_i}{e_i^2 R} = \mu^2\frac{R_i}{R},$$

which, with the help of (28) becomes

$$\eta = \frac{\mu_o^2 R_i R}{(R + R_o)^2}, \qquad (29)$$

The amplification is, therefore, a maximum when R is equal to R_o.[14]

The power developed in R is

$$P = \frac{\mu_o^2 e_i^2 R}{(R + R_o)^2}, \qquad (30)$$

from which it follows, as was to be expected, that the power in R is a maximum when the external output resistance R is equal to the output impedance R_o of the tube.

It is readily seen that the current amplification is given by

$$\xi = \frac{\mu_o R_i}{R + R_o}, \qquad (31)$$

from which it follows that the current amplification asymptotically approaches zero as R is increased, the maximum current amplification being obtained when R becomes infinitely small compared with R_o.

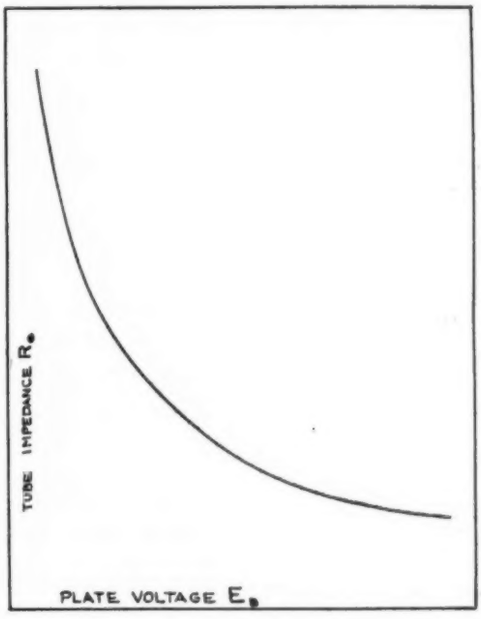

Fig. 10.

Putting $R = R_o$ in (29) and $R = 0$ in (31) and remembering that the slope of the curve giving the relation between plate current and grid voltage is given by

$$S = \frac{\mu_o}{R_o}, \qquad (15)$$

we get for the maximum power amplification

$$\eta' = \frac{\mu_o R_i}{4} \cdot S, \qquad (29a)$$

and for the maximum current amplification

$$\xi' = R_i \cdot S. \qquad (31a)$$

These equations show the important part played by the slope, S, of the curve giving the plate current as a function of the grid voltage. The factor, S, is equally important in the operation of tube as an oscillation generator and detector. The slope, S, is what was called by Hazeltine the "mutual conductance" of the tube.[15]

It is seen here that this quantity can be expressed in terms of the two most important and easily determined constants

[14] The amplification equations are derived on the assumption that the external output circuit of the tube contains only pure resistance. When the circuit is reactive, as is common in practice, we can, to a first approximation, substitute the effective impedance for R in the equations. Mathematical proof for this is given by J. R. Carson, Proceedings of The Institute of Radio Engineers, Volume 7, Number 2, April, 1919.

[15] L. A. Hazeltine, Proceedings of The Institute of Radio Engineers, Volume 6, Page 63, 1918.

of the tube, namely, the amplification constant μ_o and the impedance R_o.

While the amplification constant depends only upon the structure of the tube, the impedance, besides being a function of the structure, depends also upon the values of the applied voltages between filament and grid and filament and plate, as is readily seen from the above equation. If the impedance is determined as a function of the plate voltage, the grid voltage being, let us say, zero, a curve is obtained somewhat like that shown in Fig. 10.

If now it is desired to operate the tube with a definite plate voltage E_B and a grid voltage E_c other than zero, the impedance under these conditions can be obtained from such a curve by adding $\pm \mu_o E_c$ to E_B and reading off the impedance from the curve at a value of the plate voltage equal to $E_B \pm \mu_o E_c$.

In designing a tube, the structural parameters are so chosen that the tube constants have definite values depending upon the purpose for which the tube is to be used. Suppose it is desired to design a two-stage amplifier set. Since the tube is a potential-operated device, the voltage impressed on the input of the tube must be made as high as possible, irrespective of the value of the current in the input circuit.

This is usually done by stepping up the incoming voltage by means of a transformer, the secondary of which is wound to have as high an impedance as possible. For the same reason when the output current of one tube is to be amplified by another, the first tube is made to work into an impedance or resistance which is large compared with its internal output impedance.

Such an arrangement allows of a large voltage amplification being obtained from the first tube. This follows from equation (28) which also shows that when used as a voltage amplifier, the tube must have a large amplification constant μ_o. Referring to equation (26), however, it is seen that the larger μ_o is, the smaller is the input voltage e that can be impressed on the tube without producing distortion, provided that E_B is fixed.

When it is necessary to use a two or three-stage amplifier set, the incoming voltage is generally so small that μ_o for the first tube can be quite large and the plate voltage still not excessively high. But then the voltage impressed on the second tube is much larger than that impressed on the first, and the second tube must be so designed as to be capable of handling this voltage. If the first tube, for example, has an amplification constant equal to 40 and works into a resistance four times its own impedance, the voltage on the second tube is 32 times that impressed on the first.

It is seen, therefore, that unless the plate voltage on the second tube be made very much higher than that on the first, the two tubes must have entirely different structural parameters, if equation (26) is to be satisfied in both cases.

Such considerations show that unless the tubes be properly designed and the plate voltages correctly chosen to satisfy equation (26), there is a practical limit to the number of stages of amplification that can be used. If the limitations imposed by equation (26) are not taken regard of, the process of amplification can result in a considerable amount of distortion, which is a serious matter when using the device for amplifying telephonic currents.

When using it for telegraph purposes, such as the amplification of radio telegraph signals at the receiving station, the distortion produced results in a waste of energy in harmonics.

VIII. Experimental Verification of Amplification Equations.

The circuit shown in Fig. 11 is not of the type customarily used in practice, but was designed to test the equations developed in the previous paragraph. This type of circuit was necessitated by the following reasons:

Referring to equation (24), it is seen that if the input voltage $e \sin p t$ is zero, the current through the tube is given by the first term of the equation, which is larger than the alternating current term. For finite values of $e \sin p t$, the resulting alternating current established in the output circuit, which is to be measured, can not be separated in the usual way from this direct current with the help of appropriate inductances and capacities, since then the measured amplification would be largely determined by the constants of the circuit.

On the other hand, it is not possible to make the amplifier work simply into a straight non-inductive resistance alone, since the direct current that would flow through the galvanometer is in most cases large compared with the output alternating current, so that a galvanometer which would be capable of carrying the direct current would not be sensitive enough to measure the output alternating current with any degree of accuracy.

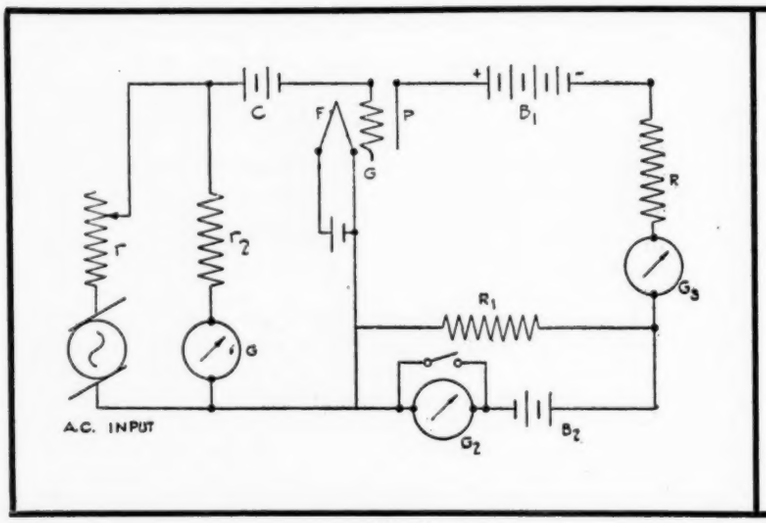

Fig. 11.

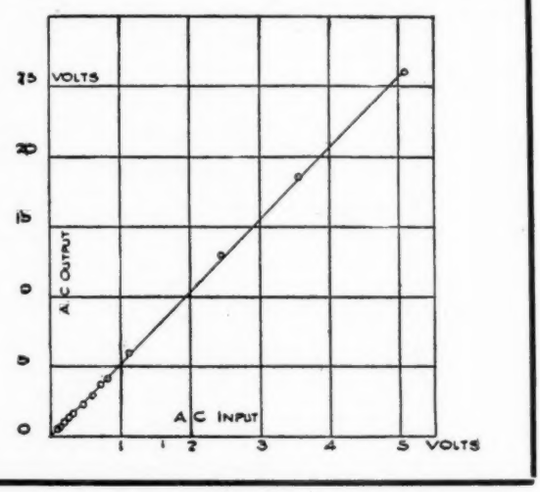

Fig. 12.

This was overcome by using a balancing circuit shown in Fig. 11. R and R_1' are two non-inductive resistances stretched upon a board. Parallel to R_1 was shunted a sensitive alternating current galvanometer, G_2, and a balancing battery B_2.

This battery was so adjusted that when no alternating current input was applied to the tube, the current through the galvanometer was zero, that is, the direct current in the output circuit went through the resistance R_1. This resistance was large compared with that of the galvanometer; hence practically all the alternating current established in the output when the input voltage was impressed, went through the galvanometer G_2.

The effective resistance into which the tube worked was, of course, given by R. The input was varied with the help of the resistances r_1 and r_2. The whole sys-

tem was carefully shielded and care was taken to avoid any effects due to shunt and mutual capacity of the leads and resistances. The input voltage was varied from a few hundredths of a volt to several volts and the frequency from 200 to 350,000 cycles per second.

Some of the results are shown in the following figures. Fig. 12 shows the output voltage (that is, the voltage across the external resistance R) as a function of the input voltage for a frequency of 1,000 cycles per second. The linear relation indicates that the voltage amplification is independent of the input voltage; hence also the power amplification is independent of the input power.

Fig. 13 shows the results obtained when the voltage amplification was measured as a function of the external resistance R. The circles show the observed values, while the curves were calculated from equation (28). It is seen that the agreement is quite good. In this case the input voltage was 0.45 volt and the value of μ_o for this tube, as measured by the direct current method explained in paragraph V was 10.2.

In another experiment, the output power was determined as a function of the external resistance. According to equation (30) this should be a maximum

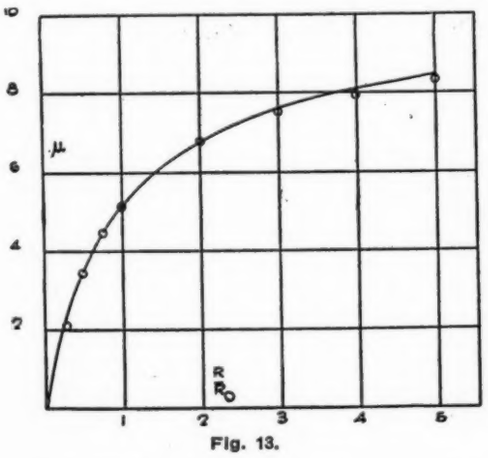

Fig. 13.

$\mu_o = 10.2$, input = 0.45 volt.

when the external resistance R is equal to the impedance R_o of the tube. In this case the input voltage e_1 was 3.55 volts, and $\mu_o = 10.2$. The impedance of the tube was kept constant at 14,800 ohms. This was done by always adjusting the plate voltage so that when the external resistance was changed the current through the tube was kept constant.

From the results given in Fig. 14 it is seen that the maximum occurs at $R =$ 15,000, which is very nearly equal to the impedance of the tube. This result is in accordance with equation (30). Furthermore, the maximum power computed from equation (30) is 22.2 10^{-3} watt, which is sufficiently close to the observed value, 23 10^{-3} watt, to verify equation (30).

This equation does not give the maximum power that can be handled by the tube but merely the power developed in the external resistance R for a given value of the input voltage e_1. The maximum power is obtained when the input voltage has the value given by equation (26).

The circuit shown in Fig. 11 was used merely to test the equation derived in this paper. It is not suitable for practical purposes where it is necessary to test a large number of tubes with the speed and facility called for in practice. If the tube is to be used as a voltage amplifier all that is necessary is a determination of the amplification constant μ_o. The actual voltage amplification obtainable in any particular circuit can then be deduced from equation (28).

When the tube is to be used as a power amplifier, a transmission test is used which is common in telephone practice. If it is desired to operate the tube as a power amplifier in a certain circuit, its amplification is tested in an equivalent circuit which is arranged so that a note of, say, 800 cycles can be transmitted either straight to a telephone receiver or, by throwing a switch, to the receiver through the tube and an artificial telephone line, the attenuation of which can be adjusted until the note heard in the receiver is of the same intensity for both positions of the switch.

When this is the case, the amplification given by the tube is equal to the attenuation produced by the line. The attenuation can be computed from the constants of the line and is usually expressed in terms of miles length of cable of specified constants.

This method of measuring and expressing the amplification is convenient in practice. But it must be remembered that this notation has very little meaning and is apt to lead to confusion unless the constants of the cable are definitely specified or previously agreed upon. It simply means that the amplification is equivalent to the attenuation which would be produced by so many miles of a certain sort of cable having a certain definite attenuation constant. Thus, the current amplification produced by the tube can be expressed in terms of length, d, of cable by the following equation:

$$d = K \log_{10} \frac{i_2}{i_1}.$$

where K is determined by the attenuation of that cable. When dealing with power amplification, K must be divided by 2.

If we adopt as standard the so-called "standard No. 19 gauge cable" used by the Western Electric Co., the length, d, is expressed in miles when the constant, K, has the value $K = 21.13$.

The fact that this constant is already finding its way into common vacuum practice would suggest its general adoption when speaking of the amplification of a tube. On the other hand, since the unit of measurement is not a cable but a constant, it might have been more desirable to adopt for K the simple value 20, which would have simplified computations. However, the main point is that it is very important to have a common agreement on the value of K.

The foregoing considerations show that the structural parameters play a very important part in the operation of the tube. On them depend the constants μ_o and R_o which appear in the amplification equations and which are involved explicitly and implicitly in the fundamental equation of the characteristic (equation 6).

Proper structural design manifests many latent possibilities of this type of device, and enables us to meet the many conditions that must be complied with in order to obtain satisfactory operation in its ever-increasing number of applications. By proper choice of the structural parameters, tubes have been designed to

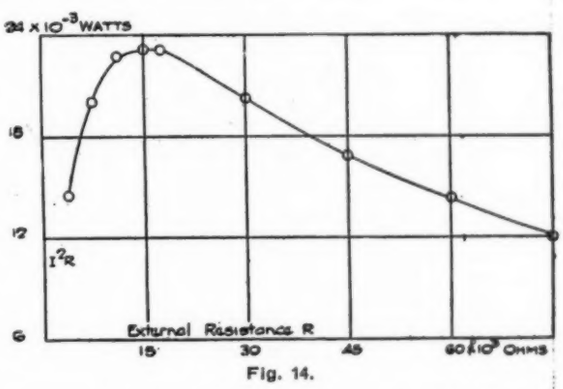

Fig. 14.

have voltage and power amplification covering a wide range.

A power amplification of 3,000-fold was found possible with a single tube using a plate voltage of only 100 volts. It is not difficult to obtain a voltage amplification of several hundred fold, but in building tubes of such high voltage amplification regard must be taken of the increase in impedance with increase in μ_o, as shown by equations (12) and (13).

Although the simple theory of operation given in this paper applies specifically to the case in which the tube is used as an amplifier, it has also been of considerable help in designing and developing vacuum tube oscillation generators and detectors. The design of a good detector tube depends very much upon operating conditions. The detecting qualities of a tube can easily be increased by designing it to

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operate on comparatively high voltages.

This is sometimes desirable in radio stations where high voltages are available and it is desired to use the heterodyne method of reception. On the other hand, it is often important to use tubes of such design that they can operate efficiently on low voltages and with small power consumption.

In this connection it may be said that detectors have been designed to give satisfactory operation with two volts on the filament and a plate voltage of 6 volts and less. In the absence of any satisfactory way of expressing the efficiency of a detector, it is unfortunately not possible to say just how good such a detector is. The problem of measuring the detecting efficiency will be reserved for a future paper.

The indebtedness of the writer is due to E. H. Colpitts and H. D. Arnold for valuable advice and kind interest which greatly facilitated the work; and to H. W. Everitt for able assistance in carrying out the experiments.

(*Conclusion.*)

Meeting of Central Illinois Association at Springfield.

The Central Illinois Independent Telephone Association held a two-day meeting in the rooms of the Toll Clearing Co., at Springfield, Ill., May 15 and 16. While the attendance was not large there was no lack of interest. There was some business of importance transacted and every one was greatly benefited by the discussions of the problems submitted.

One of the problems considered was that of the custom of giving away directories to canvassers, agents, wholesalers and others who are catering to the public en masse. The association recommended that a standard charge of $1 be made to all such requesting directories.

Another nuisance to the telephone companies is the lady canvasser or agent who comes into town and solicits magazine subscriptions in the name of a local merchant, not, however, using the local merchant's telephone because it might lose him some business by causing the line to be reported busy, but asking permission to use a telephone at the central office where it won't inconvenience any one (except the telephone company), expecting of course to pay nothing for the privilege.

Instances were cited where a canvasser spent four days and a half in one office calling up over 1,000 parties and soliciting them in the name of a local merchant to subscribe for a magazine. This problem was met by the association members all joining together in a petition to the public utilities commission for a rate covering this service to canvassers wishing to "wholesale" their calls.

Thursday evening, the 16th, a banquet was held at which Jay G. Mitchell gave an interesting, informal talk on how to prepare rate cases. He emphasized the point that a thorough preparation of the case before taking it to the commission would facilitate matters and hasten a decision.

The present officers of the association are as follows: President, B. M. Burke, Carlinville; vice-president, A. M. Howell, Hillsboro; secretary and treasurer, F. A. Bowdle, Cerro Cordo, Ill.

Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchises, Rates and Service

Vetoes Bill on Valuation of Telephone Properties.

Gov. Sleeper of Michigan has vetoed Senator Byron P. Hicks' bill which provided that in making valuations of telephone properties for the purpose of fixing rates the state commission in determining what is a "fair value" of the property, shall consider only the "actual efficient investment."

Representatives of the League of Municipalities were anxious to have this bill become a law and a delegation from Detroit appeared at the executive office recently and urged the governor to give it his approval.

Powers of Commission Upheld by S. Dakota High Court.

The defendant telephone company's charging certain patrons a message rate for switching service at one of its exchanges was in violation of an order of the board of railroad commissioners, directing the defendant to desist from the practice of charging message rates to its subscribers for switching service at any exchange with which it might be connected.

An order of the board of railroad commissioners, directing the defendant telephone company to desist from charging message rates to subscribers for switching service at any exchange, was one which the board had the power to make in the regulation of telephone service charges. The practice of the defendant telephone company of charging some patrons on some lines a flat rate for switching service and others a message rate would result in "unlawful discrimination," within the laws of 1911, c. 218, § 6.

State ex rel. Dougherty, Board of Railroad Com'rs, vs. Hurley Telephone Co.; Supreme Court of South Dakota; 171 Northwestern, 821.

Vigorous Protest Against New Nebraska Accounting System.

Many of the smaller telephone companies in Nebraska are protesting vigorously over the new order of the Nebraska State Railway Commission requiring them to install an accounting system. Many of the companies have no one on their staff who is a bookkeeper or has any knowledge of even the simple system prescribed by the commission's accountant.

In some cases the books are kept by the manager, who is also lineman and general rustler, and bookkeeping is a complete mystery to him. In other cases some man connected with the company has looked after the simple system in use, a banker, doctor, lawyer or business man. Most of these see in the new system a lot of extra work for them which they are loth to undertake, as they have never charged anything for what they have been doing and have no time to spare to do the detailed work that record-keeping in an intelligible way requires.

Members of the commission say that they expect that most of the companies will have to make provision for the payment of someone to keep the new system, and that account of this expense will be taken whenever a rate hearing is in progress. They will insist, however, that every company obey the order, as soon as it is given to them to get busy.

They argue that the company can well afford to keep the records as they have been arranged, as experience has shown that many small items of expense in connection with the operation of an exchange fail to be noted, that many officials of the smaller companies have made no charges for services rendered, such as traveling and the like, that are proper items of expense, and are necessary for the commission to know in fixing a proper rate.

The data is also considered vitally necessary for the use of the commission when making future rate adjustments, as property accounts are usually kept in such an incomplete and jumbled fashion that it is often necessary to make a gues-

at what the original investment was to determine if any sacrifices have been made for which it is proper to make compensation when endeavoring to ascertain a property value.

In the first order on new rates issued by the commission, that of the Guide Rock (Neb.) Telephone Co., formal admission is made that the cost of keeping the new accounting system must be taken into consideration in calculating operating expenses for the next year.

Recovering Compensation for Use of State Roads.

Where a telephone company made a contract with a turnpike road company agreeing to pay specified sum for the operation of the telephone line along the turnpike road, and thereafter applied to the state roads commission for a permit to construct line of telephone poles on the turnpike road, agreeing that upon the acquisition by the commission of title to the road, all rights reserved in the turnpike company by its agreement with the company should be possessed by the commission, the commission upon acquisition of the road could bring an action to recover compensation for the use of the road by the telephone company upon the latter's refusal to pay therefor in view of Code Pub. Civ. Laws, art. 91, §§ 34, 35.—Chesapeake & Potomac Telephone Co. vs. State Roads Commission of Maryland; Court of Appeals of Maryland; 106 Atlantic, 357.

Warren & Niles Telephone Gets Rate Increase.

The Warren & Niles Telephone Co. has been authorized by the Ohio Public Utilities Commission to increase its rates at Warren and Phalanx, Ohio, effective as of June 1. The rate for individual line business telephones is increased 50 cents, all residence service rates are increased 25 cents, except the rate for rural service which is not changed. Business extension and all other business service rates are increased 25 cents and P. B. X. trunk lines 50 cents per month. The new rates are as follows:

WARREN EXCHANGE.
RATES.

	Per month
Individual line, business	$3.75
Two-party line, business	$3.25
Five-party line, business	$2.50
Individual line, residence	$2.50
Two-party line, residence	$2.25
Five-party line, residence	$1.75
Ten-party rural line, business	$2.25
Ten-party rural line, residence	$1.75

PHALANX EXCHANGE.

	Per month
Main line business service	$2.75
Multi party business service	$2.25
Multi party residence service	$1.75

These rates are all subject to a discount of 25 cents per month if paid on or before the 15th day of the month in which service is rendered, or where a subscriber desires to pay quarterly in advance, a discount of 75 cents per quarter is allowed during the first month of the quarter in which service is rendered.

At the hearing on the company's application for increased rates service complaints were raised and an order was issued by the commission to investigate the service. Tests of the company's service established the fact that it was above the average and the complaints were dismissed. The summary of service tests follows:

OUTSIDE TESTS.

Average time of operator to answer line signal, 4.5 seconds.

Average time of operator to answer supervision, 12.3 seconds.

Calls answered in 10 seconds or less, 95.3 per cent.

Calls answered in 9 seconds or less, 94.4 per cent.

Calls answered in 8 seconds or less, 90.1 per cent.

Maximum time operator to answer line signal, 28 seconds.

Minimum time operator to answer line signal, 1 second.

INSIDE TESTS.

Compiled from observation made in operating room March 14, 1919.

1,741 tests—Average time operator to answer, 3.5 seconds.

These tests were made between 8 a. m. and 11 a. m. during which time the load was averaging 3,207 calls per hour with eight operators' positions covered.

LONG DISTANCE.

Average time first report on long distance calls, compiled from original toll tickets for March 4, 11 and 13, 1919.

	Via Bell Lines. Minutes.	Via Ohio State Lines. Minutes.
From Warren to Youngstown	7.9	7.8
From Warren to Cleveland	8.8	
From Warren to other points	15.6	

Harmony (Minn.) Company Gets Rate Increase.

The Minnesota Railroad & Warehouse Commission, on May 19, granted permission to the Harmony Telephone Exchange Co., of Harmony, Minn., to increase its rates as follows: Individual line business service, from $1 to $1.25 per month; individual line residence, from 75 to 85 cents per month; rural switching, from $1.50 to $2 per year.

The Harmony company operates a local exchange at Harmony, Minn., serving 151 subscribers within the village and performing switching service for 349 rural subscribers in the vicinity.

The company presented exhibits of its operating revenues and expenses for 1917 and 1918. These exhibits have been carefully checked, and it is found by the commission that the cost of operating the exchange has been reasonable. The company has never paid a dividend. The commission finds that the rates petitioned for will not yield more than sufficient revenue to provide for the necessary operating expenses, depreciation and a fair return upon the investment.

Committee to Study Compensation Named in Minnesota.

W. I. Nolan, speaker of the Minnesota House of Representatives, has announced the personnel of the interim committee appointed to study the subject of workmen's compensation insurance laws.

The resolutions for the appointment of this committee specified that it was to include the speaker himself. Besides Mr. Nolan, the other members of the committee are: T. J. McGrath and John Levin, St. Paul attorneys; Ralph J. Parker, former speaker of Spring Valley, and W. I. Norton of Minneapolis.

The House resolution provides the committee with a $5,000 fund and allows members $15 a day and expenses for time actually spent on investigations. The committee will go to Ohio in July and will later make inquiries in Washington, Oregon and other states before compiling its report to the next legislature.

No Objections to Proposed Increase in Toll Rates.

The Nebraska State Railway Commission encountered no resistance to its announced determination to increase toll rates 25 per cent on some 12 telephone companies that connect with the Lincoln Telephone & Telegraph Co. The latter secured a 25 per cent increase six months ago and lately had this continued in effect for eight months more. The connecting companies, although most of them have also been charging the increase rate on messages originating and terminating on the Lincoln lines, never made any application for an increase.

The commission summoned them to its office on May 16, to show cause why they should not publish a schedule of increased charges of 25 per cent on all toll messages. The companies summoned were the Southeast of Falls City, the Pawnee of Pawnee City, the Glenwood of Blue Hill, the Diller, the Odell, the DuBois, the Burchard, the Steele City, the Daykin, the Chester, the Staplehurst, the Surprise and the Lincoln companies.

They made no objections to the proposed order, and one will soon issue.

Rebate for Interruption of Service Due to Sleet Storm.

How long, after a sleet storm has destroyed service-giving facilities, should a subscriber keeps on paying for service that he does not get? This was the problem put up recently to the Nebraska

State Railway Commission when subscribers to the Waco exchange of the company petitioned that body to order the Lincoln Telephone & Telegraph Co. to refund or rebate charges following a sleet storm. This storm occurred on April 10. Thousands of poles were blown down or broken off by the storm, which covered three-fourths of the territory of the company and caused damages totaling $100,000.

The commission holds that no hard and fast rule can be made to apply to such cases, and that where the failure to continue service was not due to carelessness or disregard of the company for the interest of patrons, but was unavoidable, a longer period to make repairs and connections should be permitted. The facts in the case showed that the company was prompt to get at the work of reconstruction; that the principal reason for the failure to promptly restore service was due to the scarcity of labor, men being drafted from the farms and shops and heads of various districts taking on the job of superintending the replacements.

Under these circumstances the commission deemed that it should advise the company that a proper basis for a rebate should be the period beyond a week that service was not given a subscriber, and that refunds should be made for whatever period in excess thereof existed in the case of individual patrons.

At Waco a slightly different condition existed. There the patrons pay 50 cents for a county right in addition to the regular monthly exchange rate. The toll line was the first to be reconstructed, and county right subscribers desiring to talk to towns for which their county right gave them free access were charged the customary toll rate of 10 cents. The commission says that the same basis of rebate should be employed in those cases. If both services were out for two weeks, for instance, the rebate should be upon the full service; if only one was out, the refund should be for 50 per cent. As the copper circuit was employed in carrying their messages to toll points the commission cannot order a refund because of the superior quality of the service furnished.

Service Ordered Improved and Higher Rates Approved.

The South Dakota Railroad Commission, on May 12, ordered the Dakota Central Telephone Co. to remove its exchange quarters in Bristol, S. D., to proper and suitable quarters and to furnish day service beginning somewhat earlier in the morning than its present practice and to furnish emergency night service during the hours when day service is not furnished.

Upon the completion of such improvements of its service and facilities, the company is given permission to put into effect the following rates: Main line business telephones, $2 per month; main line residence, $1.50; party line residence, $1.25. Permission is given the company to quote gross rates 25 cents per month in excess of these rates and to allow that amount as a discount for payment by the 15th of the current month.

In this case complaint was filed by Dr. J. P. Byron and 42 other citizens of Bristol, asking the commission to require the company to improve its facilities and to give continuous 24-hour service, the present hours of service being 8 a. m. to 9 or 9:30 p. m. No one appeared on behalf of the subscribers in opposition to the improvements asked for or to the imposition of higher rates that might be necessary if the relief sought were granted.

The company is given until July 1 to complete the improvements to its facilities, on which date the new rates become effective.

Injunction to Restrain Abuse of Power by Mr. Burleson.

A suit for injunction to enjoin a telegraph and telephone company from collecting certain moneys, in excess of its authority, is not an attempt to control the discretion of the Postmaster General, but to restrain the abuse of power.—State ex rel. Collins, attorney general, vs. Cumberland Telephone & Telegraph Co.; Supreme Sourt of Mississippi; 81 Southern, 404.

Rate Increase Granted—Will Still Operate at Deficit.

The Mississippi Valley Telephone Co. is authorized by the Illinois Public Utilities Commission, in an order handed down April 15, to increase its rates at West Point, Basco and Sutter as follows:

WEST POINT.		
Individual line business stations.	$18	$18
Party line business stations.....	15	15
Party line residence stations....	15	15
Party line rural stations.....	11	13
BASCO.		
Individual line business stations.	$18	$18
Party line residence stations....	15	15
Party line rural stations.....	11	13
SUTTER.		
Party line rural stations.....	$11	$13

Business and residence rentals are payable monthly and if paid by the 15th day of the current month a discount of 25 cents per month will be allowed.

Rural telephone rentals shall be payable annually during the first half of the year in which the service is rendered at the office of the company in Carthage, and if so paid a discount of $1 will be allowed.

The company furnishes service to a total of 373 subscribers from these three exchanges. The plants are all of magneto type, with grounded circuits. The development at these exchanges is principally rural.

The commission found, in considering the case, that with the proposed rates and a reasonable allowance for depreciation the operating result will be a deficit. It was, therefore, deemed unnecessary for the purpose of this proceeding to determine a fair value of the property for rate-making purposes.

Conflict Over Unit Construction Costs in Nebraska.

The Nebraska State Railway Commission has summoned the officials of the Nebraska (Bell) Telephone Co. to appear before it on June 4 for the purpose of ironing out a situation with respect to the unit costs entering into construction costs where an unusual amount is necessary to give service in rural districts. Prior to the entry of the United States into the war, it was agreed between the company and the commission that the former should not be required to expend more than $75 in such construction. Anything in excess of that sum should be paid by the subscriber and the property thus paid for became that of the company.

A sharp conflict of opinion has arisen between the engineers for the company and those of the commission, the latter being unable to figure out where the former got some of their high unit costs. The difference is largely over the overhead charged. A number of applications for service where a considerable amount of construction is needed are pending, and it is the desire of the commission to secure a basis of agreement with the company before any of these are ordered.

Summary of Commission Rulings and Schedule of Hearings.

ILLINOIS.

May 27: Hearing at Chicago in the matter of the proposed rates for telephone service in Smithshire filed by the Smithshire Telephone Co. No. 8931.

May 29: Hearing at LaHarpe in the case of the LaHarpe Telephone Co. vs. the Western Illinois Utilities Co., on the complaint of inductive interference to the lines of the complainant between LaHarpe and Blandinsville, between LaHarpe and Dallas City and rural lines between LaHarpe and Stronghurst, also service in the city of LaHarpe. No. 9108.

May 29: Hearing at LaHarpe in the case of the LaHarpe Telephone Co. vs. the LaHarpe Light & Power Co., on complaint of inductive interference to lines of the complainant from LaHarpe to Bushnell via Blandinsville, Sciota and Good Hope, and to prevent the defendant company from installing its branch line to Sciota as proposed. No. 9019.

INDIANA.

May 10: Petition filed by the Vigo Mutual Telephone Co., of Libertyville, for authority to increase rates.

May 13: Petition filed by the Linton Telephone Co. for authority to issue $10,000 worth of stock.

May 14: Complaint filed by Claude Miller et al. against the Waldron Tele-

phone Exchange and the Jewett Telephone Co. at St. Paul, Ind.

May 19: Petition filed by the South Telephone Co. of Indiana and the Morris Township Telephone Co. for approval of sale and purchase.

May 22: Petition filed by the Northwestern Indiana Telephone Co. and the Chicago Telephone Co. for approval of sale and purchase of former's plant by the latter.

May 22: Hearing on petition of New Lebanon Mutual Telephone Co. for increased rates.

May 23: Hearing on petition of Veedersburg (Ind.) Telephone Co. for authority to increase rates.

June 3: Hearing on petition of Attica (Ind.) Telephone Co. for authority to increase rates.

June 4: Hearing in the matter of the Farmers Telephone Exchange of Sunman, Ripley county, vs. the Southern Indiana Telephone Co., the Batesville Telephone Co. and the Morris Telephone Co. regarding physical connection.

KANSAS.

April 28: Application of T. L. Sidebottom for a certificate of convenience and authority to transact business of a telephone utility at Belpre, and Truesdale, granted. No. 2895.

April 28: Application of the Belpre Telephone Exchange Co., a corporation, for permission to sell its telephone plants and properties at Belpre and Truesdale, granted. No. 2896.

April 28: Application of the Mildred Telephone Co., a corporation, for permission to sell its telephone plant and property at Mildred, granted. No. 2903.

April 29: Application of F. M. Campbell, doing business under the firm name and style of the Baldwin Telephone Co., for permission to increase rates at Baldwin, granted. No. 2804.

April 29: Application of the Haverhill Co-operative Telephone Co. for permission to increase telephone rates at Beaumont Junction, granted. No. 2811.

April 30: Application of L. A. Jordan for a certificate of convenience and authority to transact the business of a telephone utility at Winona, granted. No. 2905.

April 30: Application of Lenora Watts, doing business under the firm name and style of the Logan County Telephone Co., to sell his telephone plant and property at Winona, and vicinity, granted. No. 2904.

April 30: Application of the Burlington Telephone Co. for permission to increase rates at Burlington, granted. No. 2743.

May 6: Application of the Mount Ida Telephone Co. for a certificate of convenience and authority to transact the business of a telephone utility at Mount Ida, granted. No. 2900.

May 6: Application of the Mount Ida Telephone Co. for permission to issue its capital stock in the amount of $5,000, granted. No. 2901.

May 7: Application of B. M. Smith for a certificate of convenience and authority to transact the business of a telephone utility with an exchange at Silverdale, and vicinity, granted. No. 2919.

May 7: Application of William B. Rhodes for a certificate of convenience and authority to transact the business of a telephone utility at Lake City, and vicinity, granted. No. 2918.

May 7: In the matter of the application of the Allen Telephone Co. for permission to make certain changes in rates for service at Allen and Chalk, granted. No. 2724.

May 8: In the matter of the application of the Paola (Kan.) Telephone Exchange for permission to increase certain rates, granted. No. 2728.

May 8: Application of the Meriden Telephone Co. for permission to charge switching fee and discontinue the use of certain equipment, dismissed without prejudice. No. 2623.

May 10: Application of Art S. Steele for permission to sell his telephone plant and property at Oakley, and vicinity, granted. No. 2923.

May 10: Application of A. L. Gilbert for a certificate of convenience and authority to transact the business of a telephone utility with an exchange at Morrill, and vicinty, granted. No. 2910.

May 10: Application of the Morrill Mutual Telephone Co., a corporation, for permission to sell its telephone plant and property at Morrill to A. L. Gilbert, granted, No. 2911.

May 19: Application of E. N. Sloop, doing business under the firm name and style of the Lyndon Mutual Telephone Co., for permission to make certain changes in rates for telephone service at Lyndon, granted. No. 2712.

May 19: Application of the Chase Co-operative Telephone Co., a corporation, for permission to make certain changes in rates for service at Chase, granted. No. 2899.

May 19: In the matter of the application of the Colony Telephone Co. for permission to make certain changes in rates for service at Colony, granted. No. 2841.

May 19: Application of J. F. Sperry, doing business under the firm name and style of the Home Telephone Exchange, for permission to increase rates at Ness City, granted. No. 2823.

May 19: Application of the Preston Mutual Telephone Co., a corporation, for permission to make certain changes in its rates for service at Preston, granted. No. 2872.

May 19: Application of the Goessel Telephone Co., a partnership, for a certificate of convenience and authority to transact the business of a telephone utility at Goessel, granted. No. 2902.

May 19: Application of Jacob Dalke, doing business under the firm name and style of the Goessel Telephone Exchange, for permission to sell his telephone plant and property at Goessel, granted. No. 2798.

May 19: Application of the Inman Telephone Co., a corporation, for permission to increase its rates for telephone service at Inman, granted. No. 2842.

May 19: Application of the Norwich Telephone Co., a corporation, for permission to make certain changes in its rates for telephone service at Norwich, granted. No. 2867.

May 19: Application of the Burdett (Kans.) Telephone Co., for permission to increase rates, granted. No. 2835.

May 19: Application of Chris P. Graber and Peter Albright, doing business under the firm name and style of the Pretty Prairie Telephone Co., for permission to sell their telephone plant and property at Pretty Prairie, to Martin S. Mercer, granted. No. 2912.

May 19: Application of M. S. Mercer, doing busines under the firm name and style of the Pretty Prairie Telephone Co., for a certificate of convenience and authority to transact the business of a telephone utility at Pretty Prairie, granted. No. 2913.

MINNESOTA.

May 21: Permission granted to the Red River Valley Telephone Co. to increase its rates at Climax 25 cents per month.

NEBRASKA.

May 19: Application of the Bassett-Springview Telephone Co., of Bassett, for permission to make a charge of 50 cents a month for business service on rural lines; hearing had, evidence submitted, and finding that the request is a reasonable one, the commission granted the application.

May 19: Application of the Newcastle (Neb.) Electric Light & Telephone Co. for permission to charge gross and net rates, filed. Present practice of the company is to make collections at end of 30-day period of service.

May 21: Application of the Arcadia (Neb.) Electric Light & Telephone Co. for rate for excess mileage of $1.50 a mile, filed.

May 21: Application of sundry stockholders in the Swanton (Neb.) Mutual Telephone Co. for engineering assistance in making a valuation of the plant. The company was organized as a mutual in 1906, each subscriber paying $20 for a share, which entitled him to an instrument and interest in the switchboard. As property has accumulated the assessment has been raised to $35. The company has failed to maintain property, and its affairs are conducted in a loose manner. A number of shareholders desire to make it a stock company in order that service may be extended to the large number who desire it but who do not wish to buy stock. The company now serves 140 subscribers.

May 23: Application of the Guide Rock (Neb.) Telephone Co. for permission to increase business rates from $1.50 to $2 a month and residence from $1 to $1.50, granted. The commission finds that the company was organized in 1904, with a paid-up capital of $7,700. It serves 272 subscribers, and has been paying an average of 7 per cent dividends, with considerable part of its earnings going into property. The depreciation and maintenance has been neglected. The company pays its manager $185 a month, out of which he pays two operators, takes care of night service and does line work. The company gives free service to Burr Oak, Kans. The order of the commission granting the increase orders the setting aside each year of $1,700 for maintenance and depreciation, restricts dividends to 8 per cent, and requires that the remainder of the revenues be held as a reserve for replacements.

June 2: Hearing before the commission on the application of the Lincoln Telephone & Telegraph Co. for an increase of rates on 64 exchanges. Notifications have been sent to the authorities of all of the cities and towns affected.

June 4: Nebraska Telephone Co. ordered to appear before the commission on this date and justify unit costs submitted in calculations involving the building of excess and unusual construction in rural districts.

June 10: Hearing at Brady on application of the Maxwell-Brady Telephone Co. for an increase in rates and consideration of inventory.

June 11: Final hearing at Gothenburg on application of Gothenburg Telephone Co. for increase in rates and consideration and comparison of inventory values made by representatives respectively of the commission and the company.

OHIO.

May 5: Permission granted to the Warren & Niles Telephone Co. to increase its rates at Warren and Phalanx. Service complaints dismissed, investigation having revealed that company's service is above average.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

1195. What is determined by the first digit in the three-digit system? Which motion of the first selector is automatic? Which is controlled by the sending device at the calling station? What determines the number of rotary steps taken by the first selector?

1196. What equipment is found in the connector switch that is *not* found in the first selector equipment? What is one terminal of the first selector trunks? What is the other? How is the bridge cut-off relay of the calling line circuit operated in the three-digit system? How is the calling line protected from the intrusion of another call?

1197. Explain the operation of raising the first selector wipers to the level indicated by the first digit. Trace the path followed by the vertical switch-driving impulses of the first selector.

1198. What changes the motion of the first selector from vertical to rotary? Trace the path followed by the rotary switch-driving impulses of the first selector. What relays are in operated position in the first selector equipment when the stream of rotary impulses is completed?

1199. Where is the flow of current through the rotary magnet of the first selector interrupted in order to provide the switch driving impulses? Explain how the rotary motion of the first selector wipers is maintained as long as the wipers are passing engaged bank contacts and interrupted when a disengaged bank contact is reached. What is the function of relay *D*, Fig. 296?

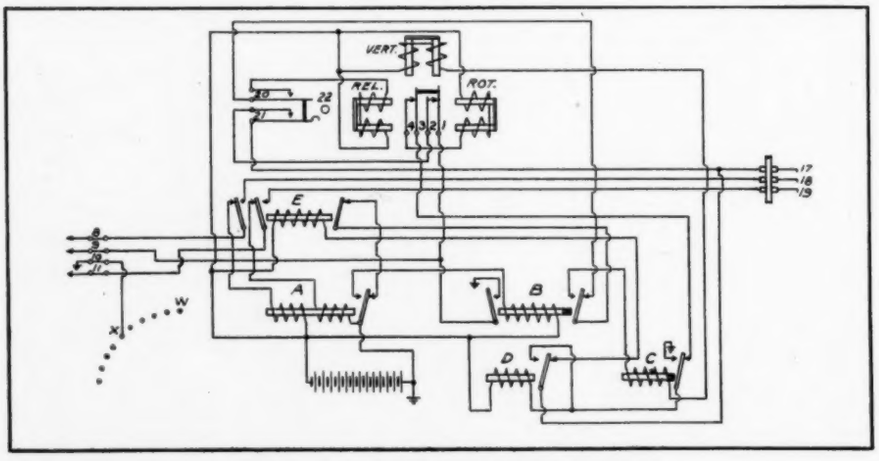


Fig. 296. Two-Wire First Selector Circuit.

CHAPTER XXXII. Mechanical Switching (Continued.).

1200. *Circuit conditions with wipers resting on bank contracts.*—The rotary motion of the first selector wiper shaft will be immediately arrested when a non-engaged set of bank contacts is reached. This is because of the release of relay *D*, Fig. 296. The release of the armature of relay *D*, due to the interruption of its energizing circuit through the normally closed contact of the rotary magnet, immediately interrupts, in turn, the intermittent flow of current through the rotary magnet windings.

This cannot occur, however, until the private wiper, 17, reaches the private bank contact of a disengaged trunk, one that is free from any connection with the positive or grounded terminal of the common battery. It can only be a contact on which the wipers of no other switch are resting.

While the wipers are passing over the bank contacts leading to engaged trunk circuits, the connection with the positive or grounded terminal of the common battery is maintained alternately through the off normal contact 21 and the normally-closed spring contact of the rotary magnet and the private wiper and private bank contact of the set on which the wipers may be resting at the moment.

When a disengaged bank contact is reached and the circuit to ground through the normally-closed contact of the rotary magnet is interrupted by the movement of its armature, no alternative path to the positive or grounded terminal of the common battery is available and relay *D* is at once released.

1201. *Elimination of switch-stepping equipment.*—The release of relay *D* completes the path for the flow of energizing current through the winding of relay *E* that is traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current flows through the private bank contact on which the private wiper, 17, is resting, the private wiper, 17, the normally-closed make-and-break contact of relay *D*, the winding of relay *E* and the common battery.

The resulting operation of the armatures of relay *E* transfers the two conductors of the trunk from the terminals of double-wound relay *A* to the wipers 18 and 19. This instantly releases double-wound relay *A*, since the circuit comprising its windings and the calling line is broken at the normally-closed make-and-break contacts of relay *E*.

1202. *The release circuit.*—The release of double-wound relay *A* completes a circuit in readiness for the operation later of the release magnet which is traceable as follows:

Starting at the positive or grounded terminal of the common battery, the path followed by the release current includes the normally-closed make-and-break contact of double-wound relay *A* (closed since the release of relay *A*, following the operation of relay *E*), the normally-closed break contact of relay *E* (now held open in order to prevent premature shaft release), the normally-closed make-and-break contact of slow-acting relay *B*, the normally-open off-normal contact 20 (now closed), the winding of the release magnet and the common battery.

It is obvious that the break in this circuit at the normally-closed contact of relay *E* (now open) will prevent the premature release of the switch shaft. When relay *E* is released the conversation being over, this circuit is completed and the resulting operation of the release magnet permits the switch shaft to drop to its normal position.

The release of relay *E* is accomplished by the removal of the connection between the grounded or positive terminal of the common battery and the private bank contact on which private wiper 17 is resting. This connection is removed as a result of the release of the succeeding switch forming the other terminal of the trunk to which the first selector is connected.

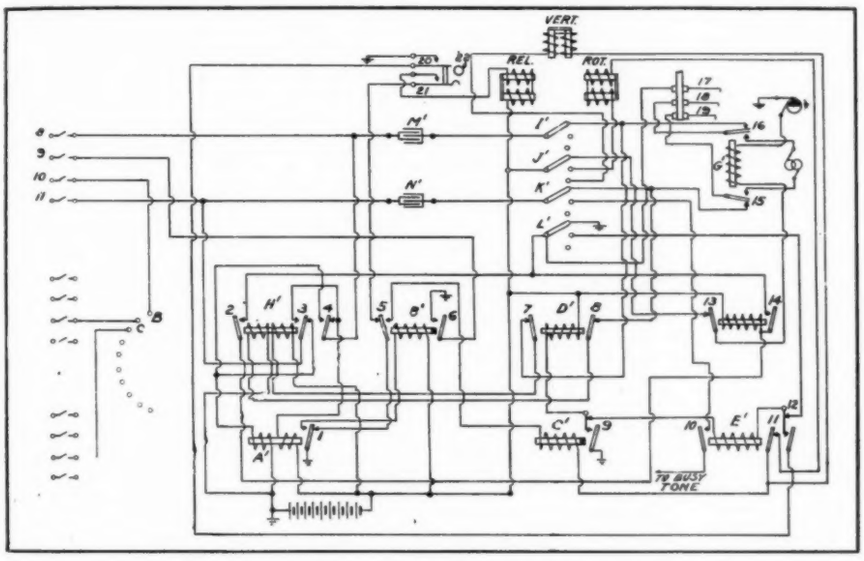


Fig. 292. Circuit Wiring Arrangement of Connector Switch.

1203. *The second digit.*—When the first selector has been driven to the level indicated by the first digit of the called number and has been driven into the level to a disengaged set of bank contacts, the calling subscriber has presumably finished the selection of the dial position for the second digit.

The operation of relay *E* has continued the circuit of the calling line to the terminals of the next switch trunk. In the case of a three-digit exchange, this trunk would be terminated in a connector switch having its wipers before a bank containing the terminal of the called line.

The operation of relay *E* has eliminated all relay equipment from the two wires of the trunk circuit as it passes through the first selector. When the call has reached the stage in which the second digit is to be sent, the calling line circuit extends, therefore, through the line-switch bank contact 8, the normally-open make-and-break contact of relay *E* (now closed), the wiper, 18, the bank contact on which it is resting, the circuit of the next switch, the bank contact on which wiper 19 is resting, wiper 19, the other normally-open make-and-break contact of relay *E* (now closed), the line-switch contact 11 and the calling telephone instrument and line circuit.

The impulses that are created when the sending device at the calling telephone is released for the second digit, therefore, pass directly through the first selector switch and reach equipment to operate the next switch in completing the call.

In the case of the three-digit exchange, the next switch to be operated is the connector switch. The wiring of this item of the equipment is shown in Fig. 292, in the type suitable for use with the other items of equipment so far described. The second and third digits, therefore, in the three-digit system, are required to operate the connector switch in precisely the same way as the first and second digits operate the connector in the two-digit system.

1204. *The connector.*—When the connector is used in the three-digit system, however, it is obvious that it will not be connected with the line-switch banks as shown in Fig. 292. The bank contacts leading to the connector switch from the first selectors are three in number for each connector trunk and correspond to the line-switch bank contacts, 8, 9 and 11, in Fig. 292.

The ground contact placed upon the private bank contact before the first selector wipers is the ground contact placed on bank contact 9 by the operation of slow-acting relay *B'* in the connector equipment. The removal of the ground contact is the initial cause of the release of the first selector switch.

(To be continued.)

Rochester (Ind.) Company Plans to Increase Its Business.

The Rochester Telephone Co., of Rochester, Ind., is planning to make a survey, in the near future, of all the territory which it covers with a view to increasing and improving the scope of the service. Letters and follow-ups will be sent to all residents who do not have telephones but who, the company says, are frequent users of their neighbors' service.

Arrangements are also being perfected to put in about a mile of underground construction, in addition to that already in, and this, with the present condition of the plant, will bring it up to a high standard of efficiency.

Henry A. Barnhart, president and chief stockholder of the company, recently assumed active management of the system.

Program for Big Kansas Reconstruction Convention.

The Kansas Independent Telephone Association has prepared an interesting program for its reconstruction convention to be held at the National Hotel, Topeka, Kans., Wednesday, Thursday and Friday of next week, June 4, 5 and 6, and a large attendance is anticipated. Wednesday morning will be taken up with registrations and renewing of acquaintances, and a meeting of the executive committee.

In conjunction with the convention, an operators' school will hold four sessions—Wednesday afternoon, Thursday morning and afternoon and Friday morning. Kansas telephone managers are urged to send as many of their operators to the school as they can spare.

The program which is scheduled to be carried out at the conventions, follows:

WEDNESDAY AFTERNOON.

Address of welcome, Herbert J. Corwine, mayor of Topeka.

Response by J. D. Waters, of Bonner Springs, vice-president of the association.

Report of secretary.

Report of treasurer.

Appointment of committees.

THURSDAY MORNING.

"The Value of Publicity to the Local Telephone Exchange," by Keith Clevinger, of Salina.

General conference.

"Government Control and Operation of Telephone Properties," by J. G. Crane of Kansas City, Mo.

THURSDAY AFTERNOON.

Address by John M. Kinkel, chairman of the Kansas Public Utilities Commission.

Address by E. B. Fisher of Grand Rapids, Mich., chairman of the board of directors of the United States Independent Telephone Association.

"Work of the Signal Corps in France," by Capt. W. S. Vivian, of Chicago, secretary United States Independent Telephone Association.

THURSDAY EVENING.

Banquet at Chamber of Commerce Rooms.

Address by Gov. Henry J. Allen.

Theater party.

FRIDAY MORNING.

"The Relation of Operators and Other Employes to the Telephone Exchange," by J. W. Berry, of Jewell City.

Reports of standing committees.

Election of officers and directors.

Sundry Snapshots Along the Trail

Observations and Comments, Pertinent and Otherwise, On the Sunshine and Shadows of Telephone Work

By Well Clay

The snow has gone from the hillsides
And the work of the summer begun;
The sun has awakened the flowers
Which blossom, one by one.

The grass is green in the meadows,
And the buds upon the trees
Have unfolded their baby leaflets
As their cradles rocked in the breeze.

We were tired of the snow and the winter
That so long held sway o'er the land.
We're glad to be out in the sunshine;
Glad that spring is at hand.

There never has been a spring just like this one, and there never will be another so filled with possibilities in which telephone men may rise or fall as managers. We are soon to be put back under the control and supervision of the people who own the capital stock in our various companies. The reversion to private ownership is not going to be a picnic for some, as the era of government ownership has planted some very fruitful seed which is going to result in a crop of trouble along financial lines that will make the average manager sit up and take notice.

The increase in salaries which we are committed to pay from now on and, indeed, which we must pay whether we have agreed to or not, is going to make the red-ink market very active. And, speaking of the subject of bookkeeping, it seems appropriate to say that there will be more need of bookkeeping this year than ever before, for the multitude of questions which are being asked, and the multiplicity of reports called for by the various commissions, will make it very necessary for telephone companies to have the data at hand.

What use will ever be made of all the accumulation of reports is, of course, another matter and beside the question. Probably no use will ever result except to keep busy a number of people who are content to spend their lives doing a perfectly perfunctory task without question or interest as to its value in the world's work.

The idea that this is so is gained by a knowledge that whenever the various departments want to know anything about the local telephone companies, they do not consult the files and glean it from the reports, but they formulate another questionnaire and send it out for the companies to fill in when they could have gathered the same information right in the Capitol at half the cost and less work.

One of the questions relating to bookkeeping which many telephone men are interested in these days, is that department which has to do with the subscriber's ledger, to which must be posted daily all the toll charges on messages originating in the exchange.

To keep each customer's account in an up-to-the-minute manner so that the shown balance on his page is the amount he owes, is a very desirable thing. Where postings are made only at the end of a month, there are apt to be losses not only of revenue from tickets not shown in the monthly balance where accounts are paid in the middle of the month as of the first, but from possible losses of slips themselves from being kept lying about until posting days.

A good many telephone men in certain sized exchanges have been interested in this matter along about the time their exchange grew to such proportions that there must either be another posting clerk or a faster method of extending balances found. The obvious answer to this question would be to adopt the adding machine method were it not for the reason that one cannot on the commercial machine of the day, designate the destination of the message but can only list the amount the same as canceled checks are handled in bank bookkeeping where it is not necessary to list more information than just the date and amount.

Suggestion has been made by some that it might be possible in handling message charges on the subscriber's ledger, to use a number for the name of the town to which the message is sent. It seems to me, however, that where there are so many towns to which messages are sent, it would take so much time for a bookkeeper to look up the town's number that too great a loss of time would ensue.

Others have said that it is not necessary to list the name of message destinations but merely to post the date and amount in the ledger and keep the original message ticket in an individual envelope and give it to the customer when he pays his account. This might work all right if every customer paid his account when he got his bill but many people ask for and receive itemized accounts of their service. Then they lose or mislay it and come back later with a request for a duplicate, which would be hard to give them if they already had the original tickets.

Where the full record of a message is written on the reverse side of a ledger sheet, as is sometimes the custom, this is not a hard thing to do. In most cases where such a record is available and is shown a patron on paying his bill, he is usually satisfied and does not care for a bill at all unless his business requires it; thus saving much clerical work in the office.

The best feature about keeping books on an adding and listing machine, as they do in banks, is that one has the charges posted as fast as they are transmitted and there is a correct balance each night extended on the customer's sheet whether there are many messages through the day or whether he has only one or two a month.

Another advantage would be that in listing messages, all sheets where a balance has been extended in any day's posting can be filed "offset" as the term is, and when the day's posting is finished, the total of the additions to the offset sheets will be the total of the day's messages charged and in this manner a "proof" is obtained very easily.

In the manner of makes of machines, there are doubtless many which are easily adaptable to the requirements. As it is no doubt true that many telephone companies already keep their accounts in this manner, I believe it would be of interest to the trade in general if those who have already adapted some such system would give their experiences in an article in these pages; or perhaps some manufacturers of posting machines who have worked out this problem for telephone company customers might enlighten us in like manner with explanations of such systems they have installed, together with forms used and methods followed.

When a customer steps into the office and asks, "How much do I owe?" or "What is the amount of my bill to date?"; if you can tell him without hesitation after a glance at his ledger page, it is more apt to create in his mind the idea that your figures are correct than if you have to tell him you will let him know in a little while as soon as you have separated his toll charges from the month's accumulation and figured the thing out.

When it gets to a point where an office must either have an additional bookkeeper or buy a machine which will enable the one to do the additional labor, it is always cheaper to buy the machine if it fills the bill because, while you must pay principal to the bookkeeper, you are

only obliged to pay interest on the machine.

The commissions will allow you to earn interest charges on the machine so there is really nothing lost and the price of the bookkeeper's wages will buy a very expensive machine in a year's time. It is only a question of whether one can be found which will fill the requirements satisfactorily. I hope to see something along this line soon.

APHORISM: The pollywog must shed its tail and its name before it becomes a frog.

Telephone Girls Housed in Beautiful German Home.

The members of the Signal Corps unit of American telephone operators for the Treves district—one of the oldest cities in Germany—are billeted in a luxurious and spacious home, the property of wealthy Germans. A high stone wall shuts it off from the city and gives privacy to the garden walks.

Inside the rooms are filled with beautiful furniture. There is a wide, open fireplace in the sitting-room with beautifully done family portraits above it. The curio cabinet is filled with rare bits of the world's art. The dining-room is lined with heavy carved paneling and there is fine linen and silver service.

On the piano is a picture of the family group—father, mother, daughters and one tall boy. The boy is now dead, killed in the early days of the war. On a table there is another picture of him as he went away to the fight in his officer's regalia of the German army. The country to whom they gave their only son has lost the war and they have lost also their home.

The family is interned in Switzerland. The house was requisitioned by the American army and stands just as they left it, with the intimate personal things about the rooms. As is being done in the case of all requisitioned property used by the army of occupation, the German government will be forced to adequately and justly recompense the owners for its use, but the A. E. F. pays nothing.

There were a couple of maids who came with the house, as happens in so many similar cases. They had been retained by the family on half pay during their stay in Switzerland and the Americans took them over with the rest of the place. At first they were frightened. Like all Germans, they were not sure what to expect at the hands of their "conquerors," but they soon lost their fear. They now serve the American women cheerfully, watching their fires carefully and serving American commissary food in their best Teuton style.

Talks to Man Underground by Radio Telephony.

A wireless telephone message from the radio station at New Brunswick, N. J., was recently received at Asbury Park inside a steel and concrete vault underground by W. Harold Warren of New Brunswick. He had a portable receiving set, carried in one hand, and no aerial or ground connection.

"A representative of the Asbury Park Press accompanied Mr. Warren," it was stated. "Two sets of head receivers were used. Wireless telephone speech from the New Brunswick radio station was heard distinctly."

The dining room of the Hotel Klein in New Brunswick was connected with the radio station by telephone, and a relay connection was made by wireless telephone. The strains of the hotel orchestra were clearly heard by Warren inside his vault.

When He Took the Examination.

Examiner: "What are the colors of the spectrum?"

Switchboard Bill: "Blue, orange, green, brown, slate."

Liggett Pins D. S. M. on U. S. Operator at Coblenz.

Before a crowd of admiring officers and enlisted men on May 22, Miss Grace D. Banker of Passaic, N. J., received the Distinguished Service Medal from Lieut. Gen. Hunter Liggett, commander of the First Army, at army headquarters at Coblenz, Germany. She is chief operator of the army telephone service there and has been overseas a year at general headquarters and with the First Army.

From Factory and Salesroom

Conventions: Kansas, Topeka, June 4-6; U. S. Association, Chicago, June 24-26

New Monarch Magneto Switchboard and Arrester Frame.

The Monarch Telephone Mfg. Co., of Fort Dodge, Iowa, has just distributed the May number of its house organ called "The Monarch Message." In this "Message" are shown the new No. 41-C Monarch magneto switchboard and No. 120 arrester frame which are also shown on another page and which are described in "The Message" as follows:

"The switchboard and arrester frame which are shown are recommended for magneto exchanges where more than 50 lines and not over 120 lines ultimate capacity is required. As the cut illustrates, the switchboard cabinet is of the low type and is arranged for mounting the drops and jacks five per strip in three panels. Double supervisory type cord equipments are provided, with high efficiency type repeating coils, to suit the requirements. Each board is wired for 15 cord circuits and may be furnished with a less number installed. The suspended type operators' set is furnished regularly with this type of board.

Standard Monarch apparatus which is described in detail in the Monarch company's Bulletin No. 35, is used in the assembly of this board. All parts within the cabinet are easily accessible and rigidly mounted. Removable doors are provided for both front and rear. Although we can furnish boards having line cables brought out at the base, it is believed that the arrangement shown with cables extending from top of the cabinet is the best for a majority of exchanges, as then the cables are kept clean and dry which is not always the case when cables are carried along the floor.

The cabinet is substantially made of quarter-sawed oak and is given a dark golden-oak finish. The switchboard is 54⅜ ins. high and occupies a floor space of 20⅝ ins. by 23¼ ins.

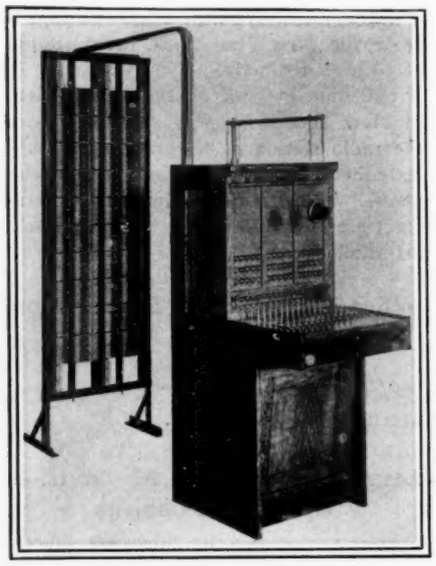
The cable support illustrated is made of channel iron of sufficient width and rigidity to carry even twice the number of cables required for a board of this capacity. Provisions are made for attaching the cable support to the top of switchboard cabinet by means of wood screws, and the frame end is made so it may be fastened to the top of frame or can be fastened to a wall if no frame is installed. The support is made so the cables may be easily laced to it and it is given two coats of black paint.

This standard cable support, as carried in stock, is made to extend straight upward 22 ins. from top of switchboard cabinet, then makes a rounded bend and extending back 36¼ ins. to top of arrester frame. Supports made longer and of same size channel iron can be supplied when exact dimensions are given.

The No. 120 arrester frame is made of angle and bar iron securely riveted together. Angle iron 'feet,' properly braced, support the frame so it does not necessarily need to be held at the top, by the cable support although this is the best arrangement. Wood fanning strips are mounted on the ironwork, these strips properly drilled for carrying the cable conductors through in pairs. The iron framework and the fanning strips are given two coats of black paint. Insulated jumper 'hooks' are provided at both top

and bottom for carrying the jumper wires properly from one bank of arresters to another.

Each standard No. 120 frame has a capacity for mounting 120 pairs of Monarch No. 1 combined carbon and fuse arresters which are made up in sections of five pairs each. The cut shows 100 pairs of arresters mounted and two extra strips (5 pairs each) of line terminals mounted at both top and bottom of the frame, for excess line cable pairs, if wanted.



New Monarch Board and Arrester Frame.

This frame is 76⅜ ins. high and 25 ins. wide. The 'feet' are 12 ins. long, therefore, the frame requires a floor space of 12 ins. by 25 ins."

New Advertising Man for Republic Motor Truck Co.

The Republic Motor Truck Co. of Alma, Mich., announces the appointment of S. R. Swiss as advertising manager. Mr. Swiss has had a long and comprehensive advertising and merchandising experience. For 11 years he directed the sales and advertising of Red Raven Splits, one of the most famous and popular trade-marked products in America. He was one of the pioneers of this concern, having associated himself with Red Raven in its early stages, and a large portion of this concern's great success can be directly traced to his personal efforts.

Following that he entered the motor truck field, which work he has been following and closely studying for the past several years. He has a thorough and sound knowledge of motor truck conditions from both a manufacturer's and retailer's standpoint, for a great part of his time has been spent in connection with the Gramm-Bernstein and Day-Elder trucks.

Mr. Swiss will make his headquarters at the Republic's executive home office, at Alma, Mich.

LeBourveau Leaves American Electric Co. for Auto Business.

L. G. LeBourveau, better known as "Lee"—one of the old timers in the telephone business—retired May 15 from his position as secretary and sales manager of the American Electric Co., Chicago. He has moved South to engage in the automobile accessory business, having offices in Atlanta, Ga., and Jacksonville, Fla. He is leaving the telephone field with the best wishes of his host of friends.

"Lee" was born in 1874 in Chicago near the section where the great telephone manufacturing industry grew up, but moved, when a lad, to Jacksonville, Fla., where he received his education and afterwards engaged in the electrical contracting business. He entered the telephone field in connection with the sale and installation of the Jacksonville Telephone Co's. plant, and afterwards connected with the Georgia Telephone Co., Savannah, and had considerable experience in the operating field, installing several other plants.

He travelled for five years in the interests of the Sumter Telephone Mfg. Co., introducing its products over a large territory and left to accept a position with the Chicago Telephone Supply Co., of Elkhart, Ind., as sales manager. He afterwards organized the telephone department for the Erwing-Merkle Electric Co. of St. Louis and had charge of its electrical exhibit at the St. Louis exhibition.

In 1905 Mr. LeBourveau assumed the position as sales manager for the Central Telephone & Electric Co., St. Louis, where he remained until 1910, leaving that position to take the position as secretary and sales manager of the American Electric Co.

S. R. Swiss, in Charge of the Republic Motor Truck Co.'s Publicity Work.

Everyone of his friends in the telephone industry will wish "Lee" splendid success in his new undertaking and feel sure that he will "carry on" with the same energy, initiative and loyalty to high business ideals which has made him successful in the telephone business.

L. G. Le Bourveau, Who Has Resigned from His Position as Secretary and Sales Manager of the American Electric Co.

Bug-Proof Telephone Sets for Use in Tropical Climates.

In some tropical countries the trials and tribulations of the telephone man are varied as compared with operators in "the States." Climatic changes and atmospheric conditions sometimes make service an uncertainty. Ants and numerous other insects get into the boxes, make nests and lay eggs. Generally many of the telephone difficulties are, at least, in part, due to the mode of living and the style of residences.

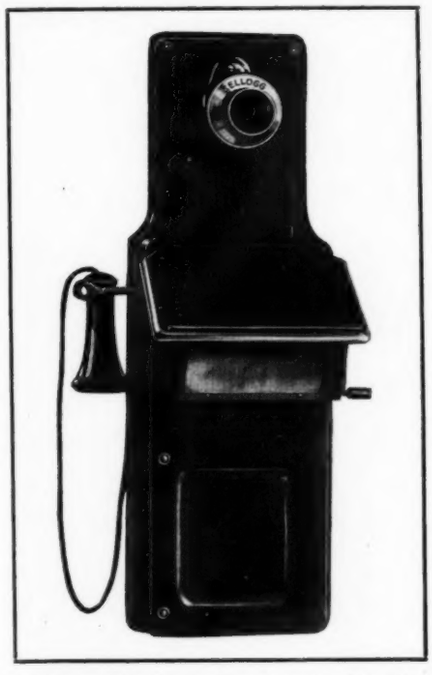
It was put up to the Kellogg Switchboard & Supply Co. to furnish telephone equipment that would give first-class service under these circumstances. First, it had to be built so that ants and even considerably smaller insects could not get into it, then to construct it electrically so that the sudden and great humidity changes would not affect the circuits, for it was found that ordinary binding posts, for instance, mounted on wood could not be used, as on certain days the wood would be so saturated with water that it would be a ready conductor, causing aggravating noises on the line, not to mention frequent "dead telephones."

The first sets manufactured by the Kellogg company to meet these conditions were similar to the one shown in the accompanying illustration. They were found so satisfactory that a second order was soon on its way.

Not only was there trouble with mois-

ture and insects, but one particular family of ants had a habit of bringing mud into the boxes for the purpose of nest building and this clay being wet would cause immediate trouble. Of course, the type of houses is such that there is little protection from outside atmospheric conditions and changes. Many of the homes are raised from the ground on bamboo and are of light construction, affording little protection from the great change of the atmosphere. A heavy downpour stopping abruptly with immediate raise in temperature is a change particularly trying to telephone instruments.

These Kellogg sets all have wire heavily enameled, all connectors being mounted on micarta insulations instead of wood, while an extra backboard insures further protection to the wiring of the instrument. These "tropical" telephone sets have proven bug-proof in every sense of the word.



Kellogg Telephone for Use in Tropical Climates.

New Type of Speed Punch for Use in the Shop.

The Jiffy punch shown in the accompanying illustration is being used by a number of telephone companies with satisfaction for punching holes in various material. It punches holes from 5/32 to ¼ of an inch in diameter through 10-gauge metal and requires little oiling and no adjusting.

The deep throat and one-piece automatic, disappearing stripper gives a clear view to the punch and punch mark for the next operation. It permits several sheets to be punched with one operation. The crowned punches of floating direct the power to the center.

It is contended that the punch will not twist or turn in operation, practically eliminating breakage. As the operator is brought close to the material, punch marks can be followed quickly and accurately. The Jiffy punch combines light weight, compactness and speed. It weighs but five pounds and is 9½ ins. long. Paul W. Koch & Co., 19 So. Wells street, Chicago, are the manufacturers of the Jiffy punch.

How the Jiffy Punch Is Operated.

Cutting the High Cost of Pole Pulling.

This may truly be called the age of machinery. For many years, in some one or more of its varied forms, machinery has been slowly, but surely, supplanting manual labor as the dominating factor in industrial production. It is doing this through the sheer force of its ability to directly improve and increase production, decrease expense, and in other ways raise the standard of production all along the line.

Machinery at the same time is exerting an elevating and beneficial influence upon labor, by relieving it of much of its drudgery and monotony, as well as increasing labor efficiency and returns. Skilled labor and machinery go hand in hand. Through the tremendous and far-reaching effects of the great world war, this evolutionary industrial transition from man to machinery has now become almost revolutionary.

Where formerly, stress of competition or desire to reach a higher state of production efficiency, was largely the impelling motive for adopting machinery, with its labor-saving and production-improving features, now the scarcity of labor, shortened working hours, higher standards and higher costs of living—all with consequent higher wages—directly contribute towards making the adoption of compensating machinery, equipment and tools more a matter of today's necessity, than tomorrow's need.

Probably none of the country's multiform industries has been more affected by the present high cost of labor condition than telephone, telegraph, electric lighting, railway and power companies.

On the one hand, they are hedged about by national, state and municipal laws and other restraints upon their rate-making powers and other means of revenue. On the other hand, they are facing mounting costs of construction, equipment, operation and maintenance. It is no wonder, then, that under these perplexing conditions such public utilities should pay attention, as never before, to the call of machinery in effectually aiding them in surmounting their acute construction and maintenance cost problems.

In consequence, public utility executives and operating chiefs are more than ever delving into the nooks and corners of their organizations for ways and means of offsetting increasing labor and other costs. As a result they are finding the "humble jack" provides a practical and satisfactory solution of their pole construction and maintenance labor and other high expense problems.

To the average "man on the street," and even to many conversant with the various uses to which jacks are put it would not be supposed that such a tool could be made to play such an important role in pole operations as does the simple and powerful mechanism known as the Simplex pole-pulling and pole-straightening jack, manufactured by Templeton, Kenly & Co., Ltd., of Chicago.

This jack is made in two models, Nos. 318 and 328. The No. 318 is what is known as the "tripping" type of jack—that is, it raises automatically through action of the lever bar, but is "tripped" or dropped instantly from any position. It has stood up under the stress and strain of years of arduous and varied pole-pulling service of many telephone, telegraph, electric lighting, power and railway companies throughout the country, and many have adopted it as standard equipment.

The No. 328 is a new Simplex model, differing from the No. 318 only in being designed to lower the load gradually, instead of "tripping" or dropping it instantly.

This improvement has been made upon suggestions of the operating chiefs and engineers of several leading public utility

companies in order to more fully benefit by Simplex jack service in several features of their pole maintenance work not contemplated in the No. 318 Simplex design—such as gradually lowering loaded poles after the decayed butt has been removed, gradually lowering loaded poles after reinforcing, resetting loaded poles in trenches, etc.

This simple tool, is said to have made "two blades of grass grow where only one grew before" in public utility pole construction and maintenance operations, thereby firmly establishing itself as one of the standard tools in this service.

During the recent great world conflict, in common with practically all American industries, both the Simplex factory and the Simplex jack did "their bit" towards carrying on and winning the war, in the way of turning out Simplex jack equipment on a large scale for government motor trucks and ordnance.

When the armistice turned the wheels of industry back from a war to a peace basis, the "Simplex" factory found its "speeded-up" war manufacturing facilities barely adequate for meeting the rapidly-growing demand for its various types of Simplex jacks of which the pole-handling jacks are prominent types.

The Simplex Pole Jack in Operation.

With pole construction and maintenance costs at such figures as to command the close scrutiny of all public utility operating chiefs, Simplex jack equipment, is more than ever of economical value.

This versatile tool is claimed to be a veritable giant in strength, exerting the combined working skill and strength of half a dozen men in pulling, straightening, resetting, etc., any size or length of pole, with assurance of time, labor and other economies that should command the earnest attention of public utility companies interested in these service economies as well as improvements.

Attractive and instructive literature and other information relating to Simplex pole-pulling and pole-straightening jacks' design and construction and what they are doing to keep down high costs of pole handling, will be gladly supplied by the manufacturers, Templeton, Kenly & Co., Ltd., 1020 S. Central Ave., Chicago.

OPPORTUNITIES (Continued From Page 35)

HELP AND POSITIONS

TELEPHONE ENGINEERING OPENINGS. We have positions offering excellent opportunities to enter the telephone engineering field. Training in electrical engineering or practical telephone experience is necessary. In reply state age and particulars of experience. Address 3647, care of TELEPHONY.

WANTED—First class cable splicer at Terre Haute, Indiana, for an exchange of over 8,000 stations. Salary, $130 per month. Citizens Independent Tele. Co., 120 South Seventh St.

POSITION WANTED—By couple. Experienced cableman and general outside man. Wife experienced cashier, chief operator, etc. Prefer South or Southwest. Address 3670, care of TELEPHONY.

WANTED—Wire chief at Lebanon, Ind. Western Electric board, 1,500 lines. Lebanon Telo. Co., Lebanon, Ind.

WANTED—First class cable splicer. Steady employment. Citizens Independent Telephone Co., Terre Haute, Indiana.

POSITION WANTED—By man with 19 years' experience in various branches of telephone work. Prefer position as wire or plant chief. Have had considerable experience in both. Can assume charge of entire wire plant inside and out. Living conditions must be good. Salary expected, not less than $150 per month, also transportation paid to job for self and wife. Address 3671, care of TELEPHONY.

WANTED—Position, by A1 telephone man; 15 years' experience. Magneto and common battery exchanges. Foremanship switchboard departments Western Electric, Kellogg and Chicago Telephone Supply Co. Will consider manufacturing rebuilt or exchange propositions. Address M. H. Brown, Three Rivers, Mich.

WANTED—Position as manager of an exchange in a town not smaller than 2,000. Eighteen years' experience. Married. Know the operating end from the ground up. Can take full charge. Address 3669, care of TELEPHONY.

WANTED—Efficient and reliable telephone man for magneto plant. Maintenance and office. Illinois. Address 3666, care of TELEPHONY.

MISCELLANEOUS

EVEN IF THERE IS SOME PART OF YOUR APPARATUS which is almost worn to a "frazzle," don't ditch it—send it to our repair experts. They'll make it like new. We give the same attention to a small as well as a large order. The Suttle Equipment Co., Olney, Ill.

TELEPHONE EXCHANGES bought and Sold. Write for bargains or list your properties for quick sale. Farm lands to exchange. G. W. Leyda. Deerfield, Wis.

FOR SALE—The controlling interest in a 300 subscriber exchange, located in southern Wisconsin. Fine rates; no free service. Income, $5,500. Management pays fine salary. Address 3672, care of TELEPHONY.

WANT TO BUY — An exchange of up to 400 subscribers, in good, clean town. Prefer one where rural lines are switched for farmers. Price and terms must be right. Prefer Iowa, Wisconsin, South Dakota or Minnesota. Address 3673, care of TELEPHONY.

Specify ROEBLING TELEPHONE WIRE

E. B. B., B. B., and Steel Grades

JOHN A. ROEBLING'S SONS CO.
TRENTON, NEW JERSEY

ARISTOS "COPPERWELD" COPPER CLAD STEEL WIRE

Steel for strength; Copper for conductivity; and the following advantages over solid copper wire — less weight — higher elastic limit—smaller diameter for equal work, giving less projected surface subject to wind pressure and capable of supporting sleet load—and for the same cost you get much more "Copperweld" than solid copper.

ARISTOS COPPERWELD

Drawn from the product of Copper Clad Steel Co. Pittsburgh

PAGE STEEL & WIRE CO.

Sales Offices: 30 Church Str et, New York

Plants: Monessen, Pa., and Adrian, Mich.

Western Representatives: Steel Sales Corporation, Chicago

12